9.2.3 Initial Environmental Examination (IEE) for Fu Mieng Multipurpose Project

(1) Project Objective and Scope

The basic objective and scope for the proposed Fu Mieng multipurpose project include:

a) Active storage of some 462 million m^3 from a total average inflow exceeding 5,320 million m^3 a year (i.e. approximately 9 % of inflows),

b) Diversion of up to $60m^3$/sec into the Dau Tieng reservoir for subsequent realease for irrigation purposes in the East Vam Co and for irrigation and salinity repulsion downstream in the Saigon River,

c) Operation of a 55 MW power station at the Fu Mieng dam site with an estimated output of some 190 GWh/year, and

d) Further storage and re-regulation of flows in the Be River as well as reuse of Fu Mieng power station releases and Dam spills for use downstream for irrigation (i.e. Phuoc Hoa Project) and water supply diversion for urban and industrial use in the HCMC-Bien Hoa-Vung Tau economic development zone.

(2) Summary of Project Description

The Fu Mieng multipurpose project would involve the following features:

a) A catchment area of some 4,110 km^2,

b) A 35 m high dam across the Be River, 16 km east of Binh Long with a 55 MW power station and open spillway included,

c) A reservoir area of 70 km^2 at Full Supply Level (FSL) and 40 km^2 at Minimum Operating Level (MOL),

d) An 7.2 km long excavated channel from the reservoir to divert 60 m^3 westward to Prek Monang entering the upper reaches of Dau Tieng reservoir, and

e) Provision of an alternate access road around the southwestern arm of the proposed reservoir to the communities of Tra Thanh and Thanh An.

The location maps is shown in Figure 9.2, and for the detail layout, refer to Appendix V.

(3) Existing Enviromental Situtation

The middle reaches of the Be River catchment including the proposed Fu Mieng reservoir in Song Be province are located as follows:

- Western 2/3 of reservoir - An Loc and Loc Ninh Sub-districts; Binh Long district, and

- Eastern 1/3 of reservoir - Phuoc Binh Sub-district; Phuoc Long district.

The entire reservoir area and much of its surrounds were zones of intensive fighting in the 1968 to 1975 period with most of the villages/hamlets being destroyed and of extensive areas subjected to defoliatation spraying and destruction of plantations and native forests by burning. No major villages have been re-established in the reservoir area, but land clearing and cultivation for rice paddy, upland crops and cashew have been ongoing since the early 1980's. It is estimated that some 500 to 550 families now reside in scattered locations throughout the proposed reservoir area or close to the diversion channel alignment.

Most of the residual land in the reservoir area not subject to recent re-occupation or used for upland crops on a seasonal basis is covered with scrub bamboo regrowth. Only scattered pockets of riverine forest remain along the main Be River and tributary streams.

As with the project area, much of the region in Binh Long and Phuoc Long districts was subjected to destruction during the 2nd Indochina War. Presently, redevelopment of upland rubber plantations is being undertaken by district (State) enterprises, and private farm development is proceeding slowly with controls on irrigation and land allocation still in place by authorities due to security requirements.

Subsistence (i.e. rice and maize) and cash crops (e.g. cashews) are most practical at this time due to constraints of land capabilities, farm access and distance to market. Due to the subsistence level of living in the area, use of residual forest and wildlife resources occurs extensively, including use by persons employed in State enterprise rubber plantations.

(4) Critical Environmental Issues of the Project

Alteration to Regime and Downstream Effects

Due to storage of water in the Fu Mieng reservoir, diversion of 60 m^3/s to Dau Tieng reservoir and power station operations, the downstream flows in the Be River will be altered, mainly through reductions in peak flows and changed flows during the dry season. Dry season flows would be more or less constant due to power station releases of 50 to 60 m^3/sec (i.e. compared with low flows of 20 to 25 m^3/sec). The resulting downstream effects would include:

a) Minor changes in erosion patterns of river banks immediately downstream of the dam in the initial years due to reservoir sedimentation,

b) Adverse effects on downstream fishes due to barier effects, but counteracted by increased aquatic habitat for growing of fish during the dry season in the river, and

c) Sufficient water remaining available for downstream requirements relating to irrigation storage and withdrawls for Phuoc Hoa project, riparian, uses, urban and industrial water

supply intakes and contributions to salinity repulsion in the lower Dong Nai River/HCMC zone.

Aquatic Ecology in Reservoir Area

a) Reservoir Water Quality

Water quality in the Fu Mieng reservoir would be of good quality even without clearing due to the limited biomass of natural vegetation in the area of impoundment. Also most of the areas surrounding the reservoir margins are rubber plantation or regrowth forest lands. Further land clearing in the immediate reservoir zone would improve water quality in the reservoir to some extent, but the reservoir is located far enough downstream of Thac Mo that incoming flows would be re-aereated and diluted substantially. Consequently, water quality problems are unlikely to occur in Fu Mieng reservoir and its diverted or released waters.

b) Reservoir Ecology and Fisheries Potentials

An aquatic community similar to Tri An, Thac Mo and Dau Tieng reservoirs should evolve at Fu Mieng reservoir including its fisheries resources. In fact, this reservoir could have a basically better aquatic ecology due to good water quality because of limited decaying vegetation. Nutrient inflows would be the critical factors. With re-vegetated rolling topography, limited agricutural development potentials (e.g. tree crops such as rubber or plantation forests and limited population in the catchment) would be limited, and thus trophic conditions are unlikely to occur.

Fisheries potentials in the reservoir should be good for development of both open water capture fisheries and aquaculture with an average surface area of 50 to 60 km^2. A preliminary estimated yield of 125 to 150 tonnes per year from open water plus 50 to 60 tonnes per year from aquaculture activities should be possible with limited management inputs. Background aquatic ecology investigations and preparation of a project fisheries management development plan should be included in the Feasibility Study/EIA for the project.

Terrestrial Ecology Aspects

Based on the limited information available from maps, aerial photographs (1979) and casual field observations, there are virtually no extensive areas of undisturbed forest and wildlife habitat in the proposed reservoir area and diversion channel areas. This appears to be primarily due to the extensive destruction of vegetation by repeated spraying and burning during the 1968 to 75 period. Even the riverine vegetation has been largely depleted except in isolated pockets and along the Be River section (i.e. northern one-third located in Loc Ninh district). Consequently, biodiversity of both plants and wildlife is limited. People moving back into the area since the year 1985 have been subsistence farmers, and rubber plantation workers besides then heavily exploit the limited wildlife which consists mainly of small mammals (e.g. Barking

deer), common birds, reptiles and amphibians (e.g. snakes and frogs). The probability of any endangered or rare species with terrestrial habitats in the reservoir area is very low except possibly for primates in the riverine fringe habitats in upstream zones.

Resettlement and Socioeconomic Aspects

Land use and socioeconomic activities within and surrounding the proposed Fu Mieng reservoir are primarily extensive agriculture with rubber plantations dominant and others tree crops such as cashew and coffee plus family subsistence plots of upland rice, maize or cash crops based on wet season rainfall. Irrigated paddy development is very limited, being confined to a few small scale projects based on diversion of local tributaries to the Be River. Rubber plantations, which are Provincial or District State enterprises, are located on the rolling hills and are not affected to any extent by the proposed reservoir.

The most important facts associated with the Fu Mieng project's potential effects relating to compensation, resettlement and socio-economic activities include:

a) The reservoir area has been severely degraded due to destruction of previous villages as well as the natural vegetation and tree crops, during the 1968 to 75 period.

b) People have been moving back into the area since the mid 1980's, establishing a few villages and cultivating upland rice and tree crops, mainly cashews and coffee, with some pepper vines.

c) The standard of living is mainly at the subsistence level with limited development of access road and other infrastructure such as schools and health posts to date.

d) The families living in the proposed reservoir are limited to road side hamlets, and thus scattered houses together with those along the diversion channel route have a total population of 500 to 550 families.

e) Losses of lands through inundation would affect persons who are living in scattered small communes along sections of roads located above the proposed reservoir's full supply level.

f) The project would seriously affect existing local access roads, in particular:

- Route 345 between An Loc and Ap Tra Tanh linking sections of major rubber plantations, and
- Route 304 between the newly established villages of Ap Tan An (Binh Long district) and Ap Ba Nho and Route 14 (Phuoc Long district) using local boats to cross the Be River.

A preliminary estimate of the compensation and resetlement costs for the Fu Mieng multipurpose project including its diversion channel and a transmission line is estimated to be US$ 40 millions in this study. This may be a conservative estimate subject to revision when better land use, population and project features as well as design data are available during a feasibility study for the Project. A comprehensive assessment of the land use, land status, compensation entitlements and resetlement costs would be an integral part of the EIA necessary for the Fu Mieng multipurpose project.

Other Critical Issues and Considerations

a) Effects on Downstream Flooding in Tributary Rivers to Dau Tieng Reservoir

One of the main objectives of the Fu Mieng project is to divert 60 m^3/s down the Prek Monong/Tonle Tru/Cham river system to Dau Tieng reservoir. The scheduling and quantities of water realeased to diversion during the flood season should be strictly controlled to avoid adverse effects possible on possible local flooding. Local flooding is an important potential issue to be included in project design and focuses on:

i. Need for sizing of channelised sections and improvements to existing river channels to accept proposed releases in addition to natural floods,

ii. Possible effects of additional releases on traditional use of flood plains for cultivation during the dry season (i.e. use of flood plains to grow market garden crops), and

iii. Potential use of water in the diversion channel for dry season irrigation (e.g. by pumping) along river bank sections of the Prek Monong/Tonle Trou/Cham river system.

These possible water-related impacts need to be specifically investigated and documented in the detailed EIA to be prepared during the feasibility study.

b) Forestry and Watershed Management

As already noted, the proposed Fu Mieng reservoir and surrounding area are severely degraded in terms of tree vegetation. Consequently, a complete assessment of land status, developments proposed by district authorities and potentials for planned revegetation through plantation and agroforestry projects is necessary. The key issues relating to forestry and watershed management in respect of the project include:

i. Needs for an action plan for an adequate tree vegetation "buffer zone" in the areas surrounding the reservoir and along the diversion channel and river systems,

ii. Need for an action plan for community based forestry projects to focus on revegetation of degraded and erosion-prone areas and on provision of income earning opportunities for local residents to minimise exploitation in critical areas (e.g. riverine fringe vegetation), and

iii. Need to capitalise on the experience gained at Dau Tieng and Tri An reservoir projects relating to watershed rehabilitation and management in Protected Forest areas being implemented by the respective provincial and district Forestry Departments and to comply with requirements of the Song Be Province's Forestry Management Plan.

c) Planning and Programming of Development and Resettlement

Although the actual resettlement requirements are indicated to be limited to 500 to 550 families, the proposed Fu Mieng project could have important effects to regional development plans and programmes being implemented by provincial and district authorities, such as:

i. Access and link roads which are being developed or are proposed in the reservoir area including a possible bridge crossing of the Be River between Loc Ninh and Phuoc Binh districts in the upstream sector of the reservoir,

ii. Need for emphasising poverty alleviation in Song Be province through agricultural development focussed on the province's northern sector including small irrigation (e.g. along diversion channel and with agroforestry projects),

iii. Need to consider land re-occupation and development programmes being implemented by the Peoples' Committees in areas previously destroyed or abandoned during the 2nd Indochina War as well as rehabilitation and expansion of State enterprise rubber or forestry plantation projects.

iv. Need to consider and improve upon the resettlement plan and programme for the Fu Mieng project based on policies and experiences at Dau Tieng and Thac Mo projects as well as based on current government policies relating to compensation and resettlement.

d) Effects of Diversion on Dau Tieng Reservoir and Saigon and East Vam Co River Systems

The main potential effects of increased releases to the Saigon River and diversion release to the East Vam Co River include:

i. Improvement to the availability of water for domestic water supply for HCMC, increased irrigation water for some 40,330 ha through the Hoc Mon/Bac Binh and the zone of East Vam Co River irrigation projects and salinity control in the Saigon River, and

ii. General improvement to pollution assimilative capacity throughout the Saigon and East Vam Co river systems including the southern sector of Ho Chi Minh City.

In respect of the second improvement mentioned above, the situtation is complex due to the interlinking canals between the East Vam Co and West Vam Co rivers as wel as due to prevailing problems relating to acid water leaching into local drains and the semi-diurnal tidal regime in these canal and drain systems, particularily due to the acid sulphate soils and agricultural development in the areas and upstream in the Mekong delta. Also downstream, these rivers become the receiving water for wastewater diposal from the southern sector of HCMC industrial zone (i.e. in the Te Canal/Doi Canal/Giou River zones). These aspects need to be considered in detail during the Feasibility Study and EIA which would be required for the Fu Mieng multipurpose project.

(5) Main Mitigation Actions to be Considered

The main mitigation actions requiring further investigation and documentation during preparation of the EIA for the Fu Mieng multipurpose project include:

a) Detailed mapping and inventory of land use, housing and infrastructure for estimating compensation and resetlement and land replacement requirements associated with reservoir, diversion canal and access road components,

b) General mapping of land status and use in the catchment area, giving due consideration to the Song Be Province Forestry Management Plan, provincial and district land development plans and project watershed protection requirements,

c) Comparative aquatic ecology and fisheries study for Thac Mo, Dau Tieng and Tri An reservoirs including applicable management programmes and associated cost estimates for a Fu Mieng reservoir fisheries development programme based on open water capture fishery and aquaculture,

d) Assessment of needs for reservoir clearing in view of limited existing tree cover and effective recovery of all wood resources with benefits to flow to local communities,

e) Detailed hydrological assessments to confirm the nature and extent of any seasonal effects of changes in regime and flooding patterns including:

- Downstream river system between diversion channel and Dau Tieng reservoir including any flooding problems,
- Be River downstream and its capacity to supply irrigation water for the Phuoc Hoa irrigation project and urban and industrial uses,
- Complexities of water distribution and quality in the East Vam Co River system including canals and drain as well as downstream receiving waters in HCMC.

- Operating parameters for Dau Tieng reservoir, and
- Potentials for local or gravity irrigation along the diversion canal and transfer rivers flowing to the Dau Tieng reservoir,

f) Detailed socioeconomic studies including household survey for reservoir area and diversion canal zone and representative surveys downstream in the Be River systems to Dau Tieng to assess the existing situtation, project effects and mitigation actions for resettlement and area development or action plans required for the EIA.

(6) Conclusion and Recommendations

The Fu Mieng multipurpose project requires a comprehensive EIA, particulary if the diversion to Dau Tieng reservoir is included. The proposed reservoir and surrounding area warrant particular attention in terms of watershed management and erosion control due to the past history of destruction of vegetation in this area during the 2nd Indochina War. The compensation and resettlement issues, although not extensive, could be complicated because land has been under re-occupation and redevelopment for agriculture in the past 10 to 15 years, so land status and holding entitlements may be uncertain. The project is considered to offer diverse and effective economic returns and to be environmentally and socially acceptable.

9.2.4 Initial Environmental Examination (IEE) for Song Luy Reservoir Project

(1) Project Objectives and Scope

The Song Luy reservoir project as currently proposed is a single purpose irrigation supply reservoir to provide storage from the natural flows in the upper Luy River besides the release of Dai Ninh project power station for irrigation of the downstream Phan Ri and Phan Thiet irrigation schemes covering an indicated net area of 42,000 ha.

(2) Summary of Description Project

Several uncertainties exist regarding the probable final configuration of the Song Luy reservoir project due to:

a) Planned upstream re-regulation and diversion of releases from Dai Ninh project power station, involving as yet undetermined water volumes which would after final dam and reservoir sizes at the Luy River,

b) Alternative damsites within the Song Luy reservoir project subject to geological conditions, within a 2 km sector of the main valley but which need to involve different

reservoir Full Supply Levels (FSL) of almost 10 m to provide the required active storage volumes in the reservoir (refer to Table 9.3),

c) Downstream releases from the Song Luy reservoir for irrigating 32,000 ha in the Phan Ri scheme and for an additional 10,000 ha in the Phan Thiet scheme based on 24 m^3/sec inflow from the Dai Ninh power station indicate a regular drawndown of the reservoir with Minimum Operating Levels (MOL) in the reservoir occurring in March through June and minor spillage only occurring in October, and

d) It is preliminarily indicated that the Song Luy storage could have some potential flood control benefits in the downstream sectors of the lower Song Luy/ Phan Ri areas, but as yet undetermined.

(3) Existing Environmental Situation

Environmental Situation in the Project Area

The middle reaches of the Luy River catchment are characterised by a 2 to 3 km wide relatively flat valley with surrounding hills draining the coastal range mountains. The valley zone immediately below the damsite has limited drainage development reflecting the horizontally bedded and permeable underlying basaltic formations and alluvial deposits with open grassland and open woodlands. Traditionally these areas have been occupied and cleared by ethnic minority groups (mainly Co Ho and Cham) for upland crops such as maize and grazing of livestock. The catchment areas, which are highly mountainous terrain, are vegetated, but have been selectively logged at least twice in the past. Highly selective logging of residual merchantable trees for furniture woods using oxen for logging and haulage is ongoing in areas immediately adjacent to the reservoir area. Rocky outcrops and shallow soil zones are open wood lands dominated by dry dipterocarp species and regrowth teak forests.

There is a new Co Ho community of 55 families located immediately above the junction of the Da Ke Trou/Song Luy junction which would be flooded by the reservoir created at the lower damsite but would not be flooded, if the upper damsite is used. A main tributary to either reservoir is the Matin River on which the Dai Ninh project power station is to be located approximately 5 to 7 km above the proposed Song Luy reservoir depending on its FSL.

Other key features of the project and its environmental setting are indicated in Table 9.3.

Regional Environmental Situation

The regional environmental setting for the Song Luy reservoir project is dynamic. In-migration into the zone downstream for shifting cultivation is occurring. Paddy cultivation occurs on the river floodplains and poor soils in its lower reaches north of the highway and railway corridor. As noted above, selective logging by individuals using ox carts is occurring near the reservoir

zone and further into the catchment. The upper reaches of the catchment are characterised by logged over moist evergreen forests which are also used extensively by local ethnic minority communities for hunting and gathering of minor forest products including bamboo and rattan. The aquatic ecology, particularly the species diversity and local populations of fish, is limited due to gorges, small waterfalls and lack of floodplain wetlands.

The main ethnic minority groups located in the 12 to 15 communities in or surrounding the proposed Song Luy reservoir are Co Ho, Cham and Ra-glai; the latter being present in the Song Martin valley. Extensive oxen and walking tracks link these communities.

Construction and operation of the Dai Ninh project would substantially change the environmental and social structure of the project area. Provision of a year round access road and the influence of the construction workforce and power station village would affect the traditional communities and their inter-relationships. Access to the area could also affect these communities in terms of their contact and integration with other groups outside the Song Luy valley, resulting in competition for access to traditional forest resources.

(4) Maps and Diagrams of the Project

The location map is shown in Figure 9.2. For the detail layout of the project, refer to Appendix VI.

(5) Critical Environmental Issues of the Project

Due to uncertainties regarding the scope of the project and reservoir size, only preliminary comments can be made regarding the Song Luy reservoir project. A basic comparison of the main potential effects of the two alternative reservoirs (i.e. downstream at 130 m FSL and upstream at 140 m FSL) is presented in Table 9.3. The main difference relates to the number of communities and families requiring resettlement; that is, 200 to 240 families in 6 or 7 communities for the 130 m FSL option compared with 300 to 350 families for the 140 m FSL option.

A possible issue will affect the basic project configuration, and these along with an Environmental Impact Assessment of the option of diversion to Ca Giay River for hydropower with Dai Ninh 2 and irrigation through the Via Ro/Ca Giay are priority considerations for rationalising the Song Luy reservoir project. Fundamentally, it is indicated that a re-regulating storage downstream of the Dai Ninh power station on the Matin River and maximising storage on the Ca Giay may be the preferred option environmentally. This would minimise disruption to the ethnic minority communities in the central Song Luy valley. This aspect needs to be confirmed not only from its physical viability but also its social implications. Caution must be expressed about pre-empting the Ca Giay damsite and storage without due consideration to the possible long term needs for additional storage for irrigation in the Phan Ri and Phan Thiet

schemes plus resettlement and relocation of the access road requirements associated with the Song Luy option.

Other critical environmental issues evident at this preliminary evaluation include:

a) An urgent need to determine the possible short to mid term environmental effects of controlled year-round releases down the Luy River by the Dai Ninh project in terms of:

- Riverbank and floodplain erosion in the vicinity of the ethnic minority communities downstream (i.e. reservoir area) since these areas are used for dry season vegetable crops,
- Potential aggravation of flooding in these communities due to combined natural flows and power station releases, and
- Effects to access between communities due to increased flows and river levels water and ox cart crossings are common during the dry season and crossing in the wet season is restricted.

b) Extent of possible similar effects to the isue above attributable to the Song Luy reservoir project in the Luy River downstream sector from the damsite to 812 weir,

c) Effects of changes in seasonal regime on aquatic ecology downstream in the Luy River,

d) Assessment of fisheries potential of Song Luy reservoir, giving due recognition to its seasonal drawdown features and ways of maximising any reservoir fisheries development benefits to the local ethnic minority groups to be resettled from the project,

e) Evaluation of induced effects such as improved road access, required reservoir area, ox cart and walking track relocations and resettlement communities on the forest and widlife resources in areas surrounding the Song Luy reservoir, and

f) An obvious and priority need to document the existing situation, proposed provincial and district plans and real needs in terms of poverty alleviation as well as health, education and agricultural development assistance for the ethnic minority communities located in the Song Luy reservoir project area, regardless of which project option is finally proposed. In fact, this task should be completed during project rationalisation relating to options for the Song Luy reservoir project.

(6) Conclusion and Recommendations

It is concluded that a sub-regional environmental and social base line study covering the combined Song Luy and Ca Giay catchments should be undertaken as a matter of priority. This study should give due consideration to and a comparison of the environmental and social effects associated with the main options (i.e. Song Luy reservoir only versus diversion for

hydropower and storage for irrigation through the Via Ro/Ca Giay). The initation of the feasibility study and an accompanying EIA for this project is recommenced as "environmental priority" for the irrigation sector projects proposed for the Master Plan. The Scope of Work and Terms of Reference for the environmental and social baseline study and any EIA for Feasibility Study for the Song Luy reservoir project should incorporate findings of the Environmental Assessment recently prepared for the Dai Ninh project and the comments outlined above and discussed in subsequent Section 9.2.5 relating to the Phan Ri and Phan Thiet irrigation schemes.

9.2.5 Initial Environmental Examination(IEE) for Irrigation Projects

(1) Background Situation

Considerable irrigation development already exists in the Study Area including some 513 schemes with a total area of some 243,000 ha. Utilisation rates in the existing schemes vary between 93 % in Long An to 182 % in Dong Nai province, with double cropping based on wet season and winter season paddy accounting for 76 % of the total average utilisation rate of 112 %.

Analyses of data collected from provincial and district water resource and agriculture offices and People's Communities have resulted in delineation of potential irrigation development in the Study Area focussing on five groups of schemes. These groups are based on ongoing schemes, schemes under of feasibility/design/ financing, schemes of priority to provincial authorities and water resource infrastructure requirements. With the implementation of the irrigation projects proposed as shown on Figure 9.2, the total irrigation area will increase to 336,000 ha which will produce an estimated 1.04 million tonnes a year by the year 2015.

(2) Project Description

Proposed irrigation development would occur primarily in areas already used for growing single crops of wet season paddy and would involve incorporation of some local small scale irrigation schemes into bigger projects. Only the Vo Dat irrigation scheme involving irrigation of some 7,000 ha would require development of "degraded" forest land. Since this project is not scheduled for development until the 2008 to 2015 period, the status of the land involved is likely to be altered. In summary, the proposed irrigation schemes included for development under the Master Plan for the period 1996 through 2015 are:

a) Rural Agricultural Development Project - 1997 to 2015

Rehabilitation and expansion of existing small, medium and large schemes as well as construction of new small scale schemes.

b) Song Be-Dau Tieng Diversion Scheme - 2000 to 2015

Final design, construction and implementation of the Phuoc Hoa irrigation scheme (45,680 ha) and supplementary development in the ongoing Dau Tieng scheme (93,390) based on construction of the Fu Mieng reservoir during the 2004 to 2008 period.

c) Phan Ri-Phan Thiet Irrigation Scheme - 1999 to 2010

Design and construction of required works to rehabilitate and expand the existing Phan Ri and Phan Thiet schemes from present 17,700 ha to 42,000 ha in the period 2001 through 2010 based on construction of the Song Luy reservoir in the years 2005 through 2008.

d) Lower La Nga Plain Irrigation Scheme - 2001 to 2015

Staged feasibility, design and construction of the Ta Pao irrigation scheme covering some 19,000 ha in the 2001 to 2009 period and the Vo Dat irrigation scheme covering some 12,600 ha in the years 2007 to 2015.

e) HCMC-Long An Delta Projects - 2004 to 2015

Construction of the World Bank funded Hoc Mon-North Bac Binh Chanh irrigation scheme covering 12,200 ha from the year 1996 through 2000, followed by the supplementary development of irrigation areas in the HCMC and Long An irrigation development schemes from the Saigon and East Vam Co rivers, totalling a further development of 77,200 ha during the 2006 to 2015 period.

The above indicated areas and timing of developments are preliminary, and thus adjustments will occur as the projects are better defined during the feasibility study and project design phases and by financing schedules.

(3) General Environmental Issues

Acceptability of Projects

Typically the environmental and social effects associated with irrigation development such as those proposed involving existing paddy land focus on the land acquisition/ compensation issues for infrastructure as well as disruption to local communities and agricultural activities during construction. In general, the farming communities involved agree with implementation of irrigation schemes, provided adequate compensation and relocation of lands are satisfactory. The problems in some areas, particularly schemes near major urban areas (such as Phuoc Hoa and Hoc Mon) where landholdings are small, relate to the complete displacement of some landholders with lands affected by major works such as main supply canals and roads.

EIA Requirements

The five groups of irrigation projects outlined above all involve development of water supply sources, drainage or receiving streams for irrigation schemes. Projects involved in Groups (b) through (e) are of sufficient size to require an EIA under Viet Nam's National Environment Agency (1995) Guidelines. Likewise the two reservoirs to be used for irrigation(i.e. Fu Mieng and Song Luy) also require EIAs. EIAs have been completed in the year 1994 for the Hoc Mon-Bac Binh Chanh irrigation scheme (in English by Electroconsult s.p.a) and for the Phuoc Hoa irrigation scheme (in Vietnamese by Institute of Water Resources Science and Research). In view of the above situation, it is suggested that an EIA component be included for each of the Integrated Rural Development, Song Be-Dau Tieng diversion, Phan Ri-Phan Thiet irrigation and HCMC-Long An delta and that separate EIAs be prepared as part of the individual feasibility study for each of the Ta Pao and Vo Dat schemes due to the long lead time and separation time for implementation.

Common Environmental Social Effects and Mitigation Measures Required

Large scale irrigation projects proposed in the Master Plan have several common environmental and social effects requiring mitigation measures of them, main ones include:

a) Alteration to water quality in streams within irrigation areas and downstream receiving water due to use of fertilizers and pesticides as well as leaching of soils (e.g. acid sulphate soils in Mekong delta and other near coastal irrigation areas),

b) Possible effects on traditional use of local water resources (e.g. streams and wells) due to changes in local surface and groundwater hydrology and quality,

c) Needs for programming construction activities to minimise effects on local cropping activities; including availability of compensation for crop losses for subsistence during construction and initial development periods,

d) Assessment planning and programming necessary for agricultural extension and credit services to enable local farmers to readily capitalise on irrigation development benefits available to them,

e) Need for public relations education and involvement of project beneficiaries into water resource allocation and management and scheme operation and maintenance through water user associations and so on,

f) Need for integration of effective soil erosion and watershed management programmes as well as need for compatible resource development such as fish ponds and community agroforestry components into individuals schemes or scheme-sectors to maximise utilisation of water resources as well as to protect them,

g) Need to include medico-ecological and public health aspects, particularly water-related diseases such as malaria, as well as to include monitoring and control programmes into project design and implementation,

h) Long term economic and lifestyle improvement benefits for not only project area farmers but also the surrounding communities and districts due to secondary benefits associated with increased commercial and private trading, and

i) Need for inclusion of water quality, aquatic ecology, public health and social impacts monitoring programmes as an integral part of the project implementation programme in addition to monitoring of improved agricultural productivity and economic returns.

(4) Key Issues Relating to Specific Projects

Rural Agricultural Development Project

The rehabilitation and improvements to numerous small, medium and large scale irrigation projects scattered throughout the area including these along the East Vam Co River in Tay Ninh province are considered to be environmentally and socially acceptable. An EIA may or may not be required depending on the financing of this irrigation development package. Nevertheless, the general effects outlined above would apply, and particular attention would need to be given to the local effects on water quality, water availability for domestic use, upgrading the accessibility of communities to extension and credits services, the setting-up of water user associations and the monitoring of environmental and social effects of project implementation.

Song Be-Dau Tieng Diversion Project

a) Phuoc Hoa Irrigation Scheme

Construction of the upstream Pu Mieng reservoir would permit the Phuoc Hoa irrigation by constructing a small weir and a pumping station. The critical issues to be resolved in respect of the Phuoc Hoa project relate to the following:

- Resolution of priorities for irrigation development in the context of available water resources and topographical constraint; that is, what areas in Phuoc Hoa scheme can be effectively irrigated from the apparently abundant groundwater resources such as areas targeted for cash crops (either market garden or fruit trees) close to HCMC versus paddy development needs in selected areas (e.g. northern sector) for growing irrigated rice for subsistence and poverty alleviation,

- Water resource management in terms of on-farm technology and use of water such as use of trickle or sprinkler irrigation based on pumped surface supply and/or local aquifers for cash or tree crops,

- The probable "official" and "unofficial" conversion of irrigable lands in the southern sector to other uses, particularly industrial or residential purposes in the long term for land on the fringe of the HCMC/Bien Hoa development zones, and

- The advisability of further intensification of irrigation development increases close to the HCMC/Song Be/Bien Hoa urban areas where land holdings may be held by absentee landholders. This situation could cause land speculation, and furthermore water pollution problems already exiting in the main streams and rivers, could be accelerated.

It is suggested that if international assistance for financing of the Phuoc Hoa irrigation scheme is required, a revised EIA including more detailed assessments of land use, status and suitability as well as effective allocation and management of both surface water and groundwater resources would need to be prepared for project evaluation and approval.

b) Fu Mieng Reservoir

A brief description and Initial Environmental Examination (IEE) of the Fu Mieng reservoir is presented in Section 9.2.3 above.

c) Dau Tieng Extension Irrigation Project

A review of the water balance for the Dau Tieng reservoir indicates a maximum of 50,000 ha (of which 45,000 ha is currently used) can be irrigated without diversion from the Be River. An additional 48,390 ha could be irrigated by supplementary flows through the Dau Tieng reservoir with a gross diversion of 60m^3/sec. Further, gravity and pumped irrigation of a 14,300 ha in the downstream reaches of the East Vam Co River could also be implemented.

The environmental and social effects as well as mitigating measures for them associated with Dau Tieng Extension and Tay Ninh irrigation schemes would be as outlined above under "Common Environmental and Social Effects and Mitigation Measures". Project specific environmental issues relating to water quality due to irrigation of acid sulphate soils need to be investigated and documented for these schemes. An appropriate water quality monitoring programme should be included in project budgetting and implementation plans.

<u>Phan Ri-Phan Thiet Irrigation Project</u>

a) Song Luy Reservoir and Phan Ri-Phan Thiet Diversion

The final configuration of the Song Luy reservoir and Phan Ri-Phan Thiet diversion canal depends on whether the Dai Ninh 2 hydropower project is developed by re-regulating and diverting the water flows from the Dai Ninh project power station to the Ca Giay catchment. If part of the releases from the Dai Ninh project is retained in the Luy River system, or if the

diverted water to the Ca Giay for power generation is returned to the Song Luy River, they can provide irrigation water for the entire 32,000 ha in the Phan Ri plain, and further the excess flows (estimated at 11 m^3/sec) can be diverted to provide additional irrigation water for irrigating 18,000 ha in the Phan Thiet plain including some 8,000 ha irrigated jointly by the Song Quao reservoir and the diversion.

The potential environmental and social impacts of the Song Luy reservoir and Phan Ri-Phan Thiet diversion are indicated to be complex, definitely requiring an independent EIA due to:

- Uncertainties as to the hydrology water available for the Song Luy reservoir, if releases from the Dai Ninh project power station are diverted to Ca Giay catchment,

- Extent of Song Luy reservoir required depending on the item above and the extent of irrigation development downstream dependent on Song Luy diversions,

- Extent to which environmental degradation will occur in the middle and lower reaches of the Luy River if Dai Ninh project releases are not re-regulated (i.e. flood damage and sedimentation due to increased flood flows),

- Number of ethnic communities affected by the Song Luy reservoir which would be dependent on the finally selected Full Supply Level for the reservoir and confirmation of their exact locations through topographic surveys and mapping during project feasibility study, and

- Uncertainties about residual impacts on local communities and on environmental factors such as encroachment into forests which will result from roads to the Song Luy reservoir area to provide access to the Dai Ninh project power station.

Ideally an EIA covering both the Song Luy reservoir and the Phan Ri and Phan Thiet irrigation scheme would be prepared once some of the issues relating to Dai Ninh project releases and the location of downstream hydropower plant are better established. This EIA, in effect, could be an environmental and social assessment of sub-regional irrigation sector, and as such would need to comply with the requirement of bilateral or multilateral lending agencies likely to finance such development, including the following described irrigation scheme.

b) Phan Ri and Phan Thiet Irrigation System

The Phan Ri and Phan Thiet irrigation system combines net areas of 32,000 ha in the Luy River basin and 18,000 ha in the Quao river basin. By a 2 km extension to the main canal feeding the upper sector of the Phan Ri scheme and by use of the water available in the Luy River from Dai Ninh power station releases along with the flow from the Quao River, an additional 10,000 ha

of the Phan Thiet scheme can also be achieved. Hence it is proposed to construct a dam and reservoir on the Luy River to store water for irrigation purposes.

An electricity generation scheme based on re-regulating Dai Ninh power station releases and diverting these via a tunnel to a subsidiary power station on the Via Ro River, a tributary of the Ca Giay, are being investigated by PIDC 2. The allocation of water resources for combined power generation and irrigation purposes from the Luy/Ca Giay river systems based on both natural flows and discharges from the Dai Ninh power station needs to be rationalised. This would be done in a feasibility study to be completed in the 1999 to 2000 period or possibly earlier.

Some 6,100 ha in the Phan Ri and 11,600 ha in the Phan Thiet scheme already have some irrigation facilities. The area is scheduled for further development based on the Song Quao and Ca Giay irrigation supply reservoirs in the next few years. Much of the land to be developed for irrigation in the long term is already utilised for wet season paddy cultivation. Consequently, the main environmental and social impacts and mitigation measures are outlined as common environmental social effects in the early part of this Section. Additional particular issues of immediate concern and requiring investigation during the EIA to accompanying project feasibility study include:

- Due consideration of downstream effects of the Dai Ninh power station releases, if these are to be unregulated discharges to the Luy River in the initial years following project completion in terms of additional downstream flooding, erosion and sedimentation in existing or proposed irrigation scheme areas and riverside communities,

- Possible downstream flood control requirements in the coastal plain areas in terms of associated changes in regime and sedimentation induced by with irrigation development,

- Potential ecological effects on the Phan Ri and Phan Thiet estuarine zones in terms of seasonal changes in regime and water quality as well as potential inflows and build-up of agro-chemical residues (i.e. nutrients, pesticides etc.), and

- Social impacts of expanded irrigation development in the lower catchment compared with the best interests of stakeholders (ie minority ethnic groups) and any required area development programmes for the reservoir and catchment zones, including any needs for an Indigenous People's Action Plan to satisfy the project evaluation and approval requirements of multilateral lending agencies.

Lower La Nga Plain Irrigation Project

The Ta Pao and Vo Dat irrigation schemes are long term developments involving considerable new works including associated river flood control works. These projects are not scheduled for immediate implementation, definitely requiring an EIA to accompany feasibility study. In addition to the general environmental and social implications noted early, the following aspects and comments should be noted:

- Need to maintain the seasonal flood regime in the Lac Bien sub-catchment (even with flood control works) in order to preserve its wetland ecology values for the Lac Bien/ Nui Ong National Park,

- If the item above occurs and effective controls on access to the Lac Bien/Nui Ong National Park are implemented under its management plan, the proposed Ta Pao irrigation scheme would have limited long term impaction for the Lac Bien/Nui Ong National Park,

- Due consideration will have to be given to incorporation of any ethnic minority groups who are traditional residents or who have been transmigrated to the irrigation scheme or surrounding areas (e.g. Cho Ro in Tanh Linh area),

- The extent of vegetation cover in the proposed Vo Dat irrigation area is likely to change substantially between the year 1995 and the project implementation in the 2011 to 2015 period,

- Needs for a "land freeze" on allocation of lands in the main construction zones such as weir sites, main canal and flood control works should be duly considered by the People's Committees of the districts involved in order to minimise land compensation and resettlement requirements during project implementation, and

- Pilot projects based on direct pumping should probably be implemented in the area to determine cropping patterns and economic returns for broader scale irrigation development planning and agricultural extension credit programmes.

HCMC-Long An Delta Irrigation Project

a) Hoc Mon-Bac Binh Chanh Irrigation Project

A comprehensive Environmental Impact Assessment (EIA) for this project was included in the "Project Preparation" documents for World Bank (IBRD) evaluation in the year 1994. The further environmental or social inputs required would focus on monitoring of the project's ongoing implementation (eg water quality) and economic benefits. This data will prove to be

useful in more detailed assessments of projects scheduled for the HCMC/Long An/Delta area and others such as Phuoc Hoa and Dong Nai riparian schemes.

b) HCMC and Long An Delta Irrigated Agriculture Projects

These schemes, which focus on the delta soils and saline water zones of the East Vam Co and Saigon River systems located in HCMC and adjacent Long An province, are indicated to cover 100,000 ha. Irrigated agriculture already exists in the area, and thus additional water supply available through the Be River to Dau Tieng diversion would be used to expand cropping intensely to the order of 180 %.

The environmental and social effects including land compensation and resettlement requirements for those schemes would be similar to those for the Hoc Mon-Bac Binh Chanh and Phuoc Hoa schemes for which baseline data is already prepared. Also the extent to which other data is available within District People's Committees and the need for and scope of work for the EIA for these schemes will be dependent on requirements of the project funding agencies involved. It is indicated however in view of the complex water quality situation existing in the HCMC/Saigon River/East Vam Co River that an EIA should be completed.

The critical environmental issues other than compensation and resettlement relating to these schemes would include:

- Long term effects on water and soil quality, particularly relating to acid sulphate soil areas such as increased surface water acidity during construction of canals, localised acidity due to leaching during irrigation, effects on surface and groundwater and build-up of soil acidity without effective soil management techniques (e.g. raised beds),

- Downstream ecological effects in the estuary zones due to changes in regime and water quality, particularly such potential effects as;

    i. Water pumped for aquaculture ponds,
    ii. Pollution assimilative capacity in HCMC rivers and drains, and
    iii. Alteration to contamination/ sediment interactions due to changes in water chemistry and agro-chemical residues, and

- Needs for a managed environmental monitoring and remedial action plan for the construction phase, particularly needs for water for flushing and dilution during canal excavation and land reclamation activities.

It is suggested that the Scope of Work and Terms of Reference for the EIA including an environmental and social monitoring programme be based on the experience gained at the Hoc

Mon-Bac Binh Chanh irrigation scheme now under implementation and the relevant recommendations arising from the HCMC-Environmental Action Plan completed in the year 1995.

Conclusion and Recommendations

The obvious conclusion and recommendation relating to the proposed irrigation development projects included in the Master Plan are that comprehensive EIAs should be included in the feasibility study or "project preparation" documents for approving all irrigation projects outlined above. Detailed Terms of Reference for the required EIAs should be prepared for groups of projects or individual schemes and should be incorporated in the schedules and budgets as appropriate.

9.2.6 Initial Environmental Examination (IEE) for Bien Hoa to Vung Tau Water Supply Pipeline

(1) Project Objectives and Scope

The proposed Bien Hoa-Vung Tau water supply pipeline is to be located along the new Highway 51 and is at the concept stage only. The preliminary objective of this project is to supply 1.7 million m^3/day of water along with other water sources to satisfy the long term urban and industrial demands in the Bien Hoa-Vung Tau corridor.

(2) Summary of Project Description

The Bien Hoa-Vung Tau water supply pipeline would include:

a) Construction and operation of a water supply system based on a pipeline located within the right of way corridor for the newly planned express way running along the existing of Highway 51 between Bien Hoa intake at Thien Tan and Vung Tau via Long Thanh and Long Dat.

b) Subsidiary feeder pipelines into towns such as Bien Hoa, Tam Phuoc, Long Thanh and Nhon Trach in Dong Nai province and Vung Tau, Ba Ria, Long Son, Long Hai, Phuoc Tinh, Long Bien, Phuoc Hai and Phu My in Ba Ria-Vung Tau province plus (not mapped) the associated industrial/ urban development estates shown in Figure 9.3 and delineated in Appendix VII.

c) Treatment works at various locations yet to be determined.

This project is an integral part of the programme for the HCMC-Bien Hoa-Vung Tau economic development zone which has already commenced with industrial premises under construction in

estates such as Amata, whilst the construction of Phu My thermal power station is about to commence.

(3) Existing Environment and Route Selection

The existing environmental and socioeconomic situation within the area of the proposed project is complex with land use varying from urban areas to rubber estates through houses and commercial premises along roads to open agricultural or barren lands. Detailed topograhical surveys of the highway and pipeline corridor have not yet occurred. Consequently, only general comments can be made relating to the potential effects during construction and operation of the pipeline.

Likewise detailed plans are not available relating to the exact locations and types of all the future industrial estates and urban areas to be developed, resulting in the routes for service pipelines to be determined yet. So, indirect or induced impacts associated with providing water supply such as water disposal can only be commented upon in general and with reference to expected situations.

(4) Critical Environmental Issues of the Project

Selection of the Pipeline Route

It is presumed that the selected pipeline route will be located within the proposed new National Highway 51 right-of-way as much as feasible. Any pipeline sectors outside the highway right of-way corridor are presumed to be located in unoccupied land either agriculture, tree crop plantation or industrial estates. It is assumed that the relocation of houses and other infrastructure other than the crossing of local access roads would be avoided to the fullest extent possible.

Effects on Pipeline Construction

The main environmental impacts associated with the pipeline projects are associated with its construction programme. With the proposed pipeline to be located within the highway right-of way corridor and crossing a limited number of other roads, the main impacts during construction would relate to:

a) Temporary and localised disruption to local traffic on the highway and adjacent roads due to haulage of materials, movement of machinery and excavating across roads at certain locations,

b) Temporary nuisance to local residents over periods of 2 to 3 days due to noise and dust during trench excavation, pipeline laying and back filling of the trench,

c) Possible crop losses due to needs for construction across agricultural land in production, for which compensation would need to be paid, possibly including loss of tree crops such as cashews or rubber,

d) Need for due consideration and rapid rehabilitation of the pipeline right of way, particularly relating to local access roads and drains or crop lands required for preparation for planting, and

e) Need to provide temporary access across open trenches for residents and/or livestock for access to roads or for stockwatering.

All of the above impacts are temporary and common to pipeline construction, so mitigation measures are incorporated into project design scheduling and construction supervision contracts.

Effects on Pipeline Operations

Once the pipeline is constructed and rehabilitation works are completed, the environmental impacts of the water supply pipeline would be minimal during its operational phase. Appropriate safety and maintenance procedures for water supply pipelines are well established and it is only in the unlikely event of a pipeline failure due to accidental rupturing that there would be any possible adverse effects such as local flooding or erosion. This is a very low risk event and potential event.

The other operational effects associated with water supply pipeline would relate to disposal of waste materials used in treatment plants. In the case of the Bien Hoa-Vung Tau water supply pipeline, it is most probable that industrial waste disposal sites will be available locally and appropriate disposal of treatment plant wastes can be maintained on a long term basis. This aspect should be confirmed in any EIA prepared for the project.

Indirect or Induced Effects

The provision of water supply to the expanded urban and industrial development zone between Bien Hoa and Vung Tau is only one component of the regional economic growth programme. The main indirect effect relates to the obvious needs for development of appropriate sewerage and industrial waste water treatment as well as disposal in all industrial estates and urban areas. Likewise the provision of adequate drainage in these areas is also required. The basic precautions and comments which can be made at this IEE stage include:

a) Concern over the possible adverse effect of industrial wastewater disposal and urban runoff from the Nhon Trach, Phuoc Thai, Phu My/My Xuan and Long Son industrial estates along with associated urban areas of Vung Tau and port development (e.g. Can Gio and Thi Vai/Cep Mep) in the Thi Vai/Ba Gioi/Go Gia estuary zone, which is

characterised by poor flushing characteristics and includes the eastern delta's main mangrove forests,

b) Long term deterioration in water quality and possible build-up of pollution in sediments in the eastern part of the delta and inshore areas of Vinh/ Gahn Rai; to the ecological degradation of this estuarine system, and

c) Possible contamination of the lower reaches of the small river systems draining the Bien Hoa-Vung Tau corridor (i.e. La Buong, Ca, Phuoc Thai and Dinh rivers) due to reduced flows from upstream water supply storages and runoff from urban and industrial areas.

It must be emphasised that the above indicated effects are not directly attributable to the proposed Bien Hoa-Vung Tau water supply pipeline project, but rather with expansion of urban and industrial development of which water supply is only one component. The long term economic and public health benefits from a reliable and safe water supply system for this developing area which could have a population exceeding two million within the next twenty years far outweigh any of the short term impacts or indicated above.

(5) Conclusion and Recommendations

The proposed Bien Hoa-Vung Tau water supply pipeline project is not explicitly required to be subject to an EIA under the present Vietnamese EIA guidelines. It is planned that the pipeline alignment will be included in the new Highway 51 right-of-way corridor and possibly constructed at the same time as the highway. If so, then the pipeline construction could be included as a component of any EIA prepared for the new Highway 51 project. Similarly, the above referred indirect impacts relating to water quality and risks from industrial and urban development would be part of any individual EIA or an environmental and social assessment of the HCMC-Bien Hoa-Vung Tau economic development zone.

TABLES

Table 3.1 Main Land Use And Forest Cover in the Study Area - 1991 ('000s ha)

Province	Total Area	Agri Land	Forest Land	(Natural Forest)(1)	(Planted Forest)(1)	Unused Land	Other Land
1. Ninh Thuan	343	42	97	(97)	(0)	150	54
2. Binh Thuan	799	88	354	(353)	(1)	252	105
3. Dac Lac(2)	495	44	307	(303)	(4)	120	25
4. Lam Dong(3)	1017	83	630	(621)	(9)	167	137
5. Dong Nai	586	228	172	(140)	(32)	86	101
6. Song Be	955	202	285	(283)	(2)	83	71
7. Tay Ninh	402	206	43	(41)	(2)	416	52
8. HCMC	209	93	34	(16)	(18)	10	72
9. Ba Ria-Vung Tau	196	80	37	(19)	(18)	50	29
10. Long An(4)	216	107	9	(2)	(7)	53	47
Total ('000 ha)	**5218**	**1173**	**1968**	**(1875)**	**(93)**	**1387**	**693**
Percentage of Total	100%	22%	39%	(37%)	(2%)	27%	12%

Notes:

(1) Areas listed for natural and planted forest combined are equal to Forest Land area in preceding column.

(2) Based on 19.4% of Dac Lac province located in the the Study Area.

(3) Based on 74.0% of Lam Dong province located in the the Study Area.

(4) Based on 51.3% of Long An province located in the the Study Area.

Table 4.1 Summary of Present Land Use of the Dong Nai Basin Project Area (1993)[1]

MAPPING CODE	LAND USE TYPE	AREA	
		ha	%
	Agriculture Land	**1,842,380**	**37.2**
	Annual Crops	1,388,88	28.05
1	Triple irrigated rice	170	0.01
2	Double irrigated rice	180,840	3.65
3	Single irrigated rice	176,270	3.56
4	Double rainfed rice	48,050	0.97
5	Single rainfed rice	16,280	0.33
6	Single rr./rainfed	266,350	5.38
7	rice+upland crops	517,630	10.45
8	Upland crops	76,780	1.55
9	Pineapple/Sugarcane	106,510	2.15
	Shifting Cultivation		
	Perennial crops	453,500	9.15
10	Coffee	29,600	0.6
11	Rubber	282,650	5.7
12	Cashew	105,840	2.14
13	Mulberry	680	0.01
14	Cinnamon	1,420	0.03
15	Fruit trees	33,310	0.67
	Forestry Land	**1,752,740**	**35.38**
16	Mangrove forest	66,260	1.34
17	Melaleuca forest	10,400	0.2
18	Bamboo forest	236,590	4.78
19	Pine forest	202,770	4.09
20	Evergreen forest	1,036,56	20.93
21	Plantation forest	200,160	4.04
	Other Land	**1,241,270**	**25.05**
22	Bush/grass	385,270	7.78
23	Salt pans	890	0.02
24	Bare land	839,690	16.95
25	Settlement/Orchards	14,100	0.28
27	Rocky hill	1,320	0.02
	River, Lake, Stream	**117,240**	**2.37**
	Total Project Area	**4,953,630**	**100**

Note:

(1) Based on interpretation of February/March 1993 Landsat Imagery by National Mekong Committee of Viet Nam's Integrated Resources Mapping Centre (IMRC).

Table 4.2 Changes in Forest Coverage by Province in the Study Area 1943 - 1991 (in '000 ha)

	Province	Total Area	1943	1973	1985	1991	1943-91 Loss(%)
1	Ninh Thuan	343	320	63	124	97	223(70)
2	Binh Thuan	799	444	209	259	354	90(20)
3	Dac Lac(1)	495	466	250	267	307	159(34)
4	Lam Dong(2)	1,017	996	582	755	630	366(37)
5	Dong Nai	586	378	318	247	172	206(54)
6	Song Be	955	610	536	226	285	325(53)
7	Tay Ninh	402	157	126	75	43	114(73)
8	Ho Chi Minh City	209	0	35	39	34	+34-
9	Ba Ria-Vung Tau	196	119	93	27	37	82(42)
10	Long An(3)	216	0	0	19	9	+9
	Totals	5,218	3,490	2,212	2,038	1,968	1,522(44)
	Percentage of Total Area	(100)	(69)	(44)	(40)	(38)	(29)

Notes:

(1) Based on 19.4% of Dac Lac province located in the Study Area.
(3) Based on 74.0% of Lam Dong province located in the Study Area.
(3) Based on 51.3% of Long An province located in the Study Area.

Table 5.1 Indicated Species Diversity for Fauna Relating Viet Nam Totals to Study and Project Areas[1]

Animal Group	Total for Viet Nam	Proposed for Red Book(2)	Estimate for Study Area	Estimate for Undistrubed Areas
Mammals	273	78	60-80	40-50
Birds	780	83	350-400	150-250
Reptiles	180	42	50-60	30-40
Amphibians	80	?	3-40	20-30
Freshwater fish	471	?	120-200	40-50
Saltwater fish	2,000	?	100-150[3]	30-40[3]

Notes:

(1) Based on general review of information available on species diversity in references reviewed to date and experience elsewhere in Southeast Asia relating water resource development project environmental impact assessments.

(2) Reference: ADB (1993).

(3) Estimate relates to estuarine species only.

Table 5.2 Preliminary List of Main Mammals (Excluding Bats) Likely to Occur in the Study Area (1/2)

Habitat Types - UF - Undisturbed Upland Forest RF - Riverine Forests
DF - Disturbed Forest WA - Wetland Areas

GROUP/ENGLISH NAME	SCIENTIFIC NAME	VIETNAMESE NAME	HABITAT TYPE			
			UF	DF	RF	WA
1. PRIMATES						
1.1 Stump-tailed macaque	*Macaca arctoides*					
1.2 Rhesus macaque	*M. mulatta*					
1.3 Pig-tailed macaque	*M. nemestrina*					
1.4 Silvered langur	*Presbytis cristata*					
1.5 Francois langur	*P. francoisi*					
1.6 Douc langur	*Pygathrix nemaeus*					
1.7 Concolor gibbon	*Hylobates concolor*					
2. CARNIVORES						
2.1 Dhole (Red Dog)	*Cuon alpinus*					
2.2 Sun bear	*Helarctos malaynus*					
2.3 Yellow-throated Marten	*Matres flavigula*					
2.4 Ferret badger	*Melogole moschata*					
2.5 Ferret badger	*M. personata*					
2.6 Small-clawed otter	*Amblonyx cinerea*					
2.7 Eurasian otter	*Lutra lutra*					
2.8 Smooth otter	*L. perspicillata*					
2.9 Binturong	*Arctictis binturong*					
2.10 3-Striped palm civet	*Arctogalidia trivirgata*					
2.11 Banded civet	*Chrotogole owstoni*					
2.12 Masked palm civet	*Paguima lorvata*					
2.13 Common palm civet	*Paradoxus hemaphroditus*					
2.14 Spotted Linsang	*Prionodon pardicolor*					
2.15 Large spotted civet	*Viverra megaspila*					
2.16 Small Indian civet	*Vivericula indica*					
2.17 Javan mongoose	*Herpestes javanicus*					
2.18 Crab-eating mongoose	*H. urva*					
2.19 Leopard cat	*Felis bengalensis*					
2.20 Jungle cat	*F. chaus*					
2.21 Marbled cat	*F. marmorata*					
2.22 Golden cat	*F. temminckii*					
2.23 Fishing cat	*F. viverrina*					
2.24 Clouded leopard	*Neofelis nebulosa*					
2.25 Leopard/Panther	*Panthera pardus*					
2.26 Tiger	*P. tigris*					
3. ELEPHANT						
3.1 Indian elephant	*Elephas maximus*					
4. RHINOCEROS						
4.1 Javan rhinocerus	*Rhinocerus sondoicus*					

Table 5.2 **Preliminary List of Main Mammals (Excluding Bats) Likely to Occur in the Study Area (2/2)**

Habitat Types - UF - Undisturbed Upland Forest RF - Riverine Forests
DF - Disturbed Forest WA - Wetland Areas

GROUP/ENGLISH NAME	SCIENTIFIC NAME	VIETNAMESE NAME	HABITAT TYPE			
			UF	DF	RF	WA
5. UNGULATES						
5.1 Eurasian wild pig	*Sus scrofa*					
5.2 Lesser mouse deer	*Tragulus javanicus*					
5.3 Large mouse deer	*T. napu*					
5.4 Sambar deer	*Cervus unicolor*					
5.5 Barking deer	*Muntiacus muntjak*					
5.6 Gaur	*Bos frontalis*					
5.7 Banteng	*Bos javanicus*					
5.8 Kouprey	*B. sauveli*					
5.9 Serow	*Capricornis sumatrensis*					
6. PANGOLINS						
6.1 Malaysian pangolin	*Manis javanica*					
7. RODENTS						
7.1 Squirrels	*Callosciurus spp. (3-4)(1)*					
7.2 Tree squirrels	*Tamiops spp. (3)*					
7.3 Flying squirrels	*Hylopetes spp.(2)*					
	Petaurista spp.(2)					
7.4 Bamboo rats	*Cannomys badius*					
	Rhizomys spp (3)					
7.5 Bandicoot rats	*Bandicota spp.(2)*					
7.6 Spiny rats	*Maxomys spp. (2)*					
7.7 Asian mice	*Mus spp (4-5)*					
7.8 White-bellied rats	*Niviventer spp.(2)*					
7.9 Rats	*Rattus spp. (5-6)*					
7.10 Brush-tailed porcupine	*Atherurus macrorus*					
7.11 Short-tailed porcupine	*Hystrix brachyura*					
8. HARES						
8.1 Burmese hare	*Lepus peguensis*					

Notes:

(1) Numbers in brackets ie (3-4) indicate the number of species likely to occur in the study area.

(2) * indicates rare or endangered species as listed in the proposed IUCN Redbook for Viet Nam.

Table 5.3 Major Special Use Forest (Spu) Reserves in the Study Area

Name	Province	Biodiv Value	Mgmt Plan (YEAR)	Status Year	Infrastructure	Buffer Zone (ha)	Tourism Potential	Survey Priority	Urgency of Action	Threats	Sacale of Threat
Yok Don	Dac Lac	A	1992	NP 1986	Yes	5,000	Medium		X	F,H	Low
Chu Yang Sinh	Dac Lac/Lam Dong	A	1994	NR 1986	None	2,000	-		X	?	Low
Thuong Dong Nhim	Lam Dong	B	-	-	None	5,000	-		X	H	High
Bi Dup	Lam Dong	A	1994	-	None	5,000	Medium		X	E,H	Medium
Bien Lac/Nui Ong	Binh Thuan	B	-	NR 1986	None	5,000	-		X	L,C	High
Cat Tien	Dong Nai	A	1993	NP 1986	Yes	10,000	High		X	E,H,L	High

Biodiversity Value: A=Very Important, B=Important

Status: NP=National Park, NR=Nature Reserve

Threats: C=Cutting fuelwood, E=Encroachment, F=Fishing, H=Hunting, L=Logging, M=Mining

Table 5.4 Existing and Proposed Wetland Reserves in the Study Area

Name	Province	Unit	Area(ha)	Location	Special Features	Reserve	Threats	Bio	Survey	Commendations
Dam Kia Lake	Lam Dong	R	200	12 N,108 22'E	Scenic lake in pine forest	-	D	C	L	Preserve as scenic area
Don Duon Lake	Lam Dong	R	1000	11 50'N,108 35'E	Scenic lake in pine forest	-	D	C	L	Preserve as scenic area
Dam Ninh Bay	Ninh Thuan	L	2000	11 30'N,109 02'E	Small brackish lagoon, salt flats, waterfowl	-	H	C	M	Seasonal no hunting area on lagoon
Cat Tien	Dong Nai	FS	2500	11 30'N,107 20'E	Fresh water swamps and lakes, White winged duck and waterfowl	NP	H	A	M	Routine monitoring
Dau Tieng Reservoir	Tay Ninh	R	5000	11 15'N,11 32'N 106 10'E,106 30'E	Large reservoir close to Cambodian wetland	-	H,F	C	H	Survey to assess importance for waterfowl
Bien Lac Swamp	Binh Thuan	FS	2000	11 10'N,107 40'E	Lake and seasonal swamp forest	NR	C,B	B	L	Improve protection of reserve
Mui No/Mui Gia	Binh Thuan	Sa	1000	11 00'N,108 25'E	Sandy shoreline/waters	-	H,D	B	M	Seasonal no hunting area
Phan Thiet	Binh Thuan	Sa		11 10'N,107 10'E	Sandy shoreline/waters	-	H	C	M	Seasonal no hunting area
Tri An Reservoir	Dong Nai	R	10000	11 10'N,107 10'E	Large reservoir some waterfowl and fish	-	P,F	P	L	Control fishing levels
Duyen Hai	Ho Chi Minh	M	2000	10 20'N,106 55'E	Dong Nai estuary and mangroves	-	S,C	B	H	Create reserve on seaward edge

Type of Ecological Unit
- FL = Freshwater Lake
- FS = Freshwater Swamp
- R = Reservoir
- M = Mangroves
- L = Lagoon
- Sa = Salt pans

Type of Reserve
- NP = National Park
- NR = Nature Reserve
- Prov = Provincial Reserve

Types of Threats
- P = Pollution or poisoning of fish
- H = Hunting
- R = Reclamation
- C = Cutting fuel wood
- D = Disturbance of wildlife
- S = Shrimp ponds
- F = Over fishing

Bio = Biodiversity
- A = Very Important
- B = Important
- C = Minor Value

Survey Priority
- H = High
- M = Medium
- L = Low

Table 5.5 List of Main Fish Species Likely to Occur in the Study Area

SCIENTIFIC NAME	ENGLISH NAME	VIETNAMESE NAME
Family: Clupeidae		
Clupeichthys goniognathus	Shad	Cá com sông
Family: Cyprinidae		
Rasbora sumatrana	Rasbora	Lòng tong
Luciosoma setigrum	Minnow	Cá mương
Acrossocheilus deauratus	Barb	
Labiobarbus lineatus		
Cyclocheilichthys apogon		
Hampala macrolepidota	Transverse-bar Barb	Cá ba k
Morulius chrysophekadion	Black Shark	Cá ét mọi
Osteocheilus hasselti	Hasselt's Bony-lipped Barb	Mè vinh
Puntius pierrei		
Puntius orphoides		
Tor stracheyi		
Tor tambroides		
Probarbus jullieni		
Family: Siluridae		
Wallagonia attu	Freshwater Catfish	Cá leo
Family: Bagridae		
Bagroides macropterus	Bagrid	Cá chốt
Mystus nemurus	Yellow Mystus	Cá lâng
Mystus cavasius	Fatty-finned Mystus	Cá chốt giầy
Bagarius yarreli	Freshwater Catfish	Cá chiên
Family: Clariidae		
Clarias batrachus	Walking Catfish	Cá trê trâng
Family: Belonidae		
Xenentodon cancilоides	Garfish	Cá nhái
Family: Ophiocephalidae		
Ophiocephalus striatus	Snakehead	Cá lóc
Family: Anabantidae		
Anabas testudineus	Climbing Perch	Cá rô đong
Osphronemus goramy	Giant Gouramy	Cá tài tượng
Family: Centropomidae		
Chanda siamensis	Glassfish	Cá sơn
Family: Eleotridae		
Oxyeleotris marmoratus	Marble Goby	Cá bống tượng
Family: Mastacembelidae		
Mastacembelus armatus	Spiny Eel	Chạch bông
Macrognathus aculeatus	Spiny Eel	Chạch lá tre

Notes: * indicates species adaptable to reservoir conditions in Viet Nam and/or elsewhere in Southeast Asia.

Table 6.1 Estimates of Fuel Consumed for Cooking in Northeast of Mekong Zone, 1993(1)

Sector	Crop Residue ('000 tonnes)	Firewood ('000 tonnes)	Charcoal ('000 tonnes)	Kerosene ('000 m^3)	Electricity Gwh
Rural	1364	2591	45	0	26
Urban	0	1142	180	59	26
Zone Total	1364	3733	225	59	52
Viet Nam Totals	31,832	25,726	557	131	263
(%VN Total)	4%	15%	40%	45%	20%

Notes:

(1) The Northeast of Mekong Zone contains approximately 12.5% of Viet Nam's population including an estimated 6.2% in Ho Chi Minh City but accounts for a disproportionate quantity of charcoal use nationally.

Table 8.1 Preliminary Notes, Comments and Environmental Assessment for Main Dam/Reservoir Projects to be Considered in Dong Nai Master Plan Study (1/4)

PROJECT LOCATION, SIZE AND OBJECTIVES	LAND STATUS AND USE AT DAMSITE AND IN RESERVOIR AREA	KEY ENVIRONMENTAL FACTORS AND PROJECT EFFECTS	MITIGATION ACTIONS POSSIBLE OR REQUIRED	ENVIRONMENTAL ACCEPTABILITY
1. DON NAI BASIN 1.1 Dai Ninh Transbasin Diversion - Upper Dong Nai to Luy River - 300 MW - 18.9 km^2 Reservoir - Hydropower and Irrigation - 11 km tunnel to Luy River - 30,000 ha Command Area for irrigation in Luy valley	- Degraded mixed pine with some upland crops around damsite area - Pockets of pine in reservoir area as well as bare lands	- Potential adverse effects on tourism values of Bon Ron Waterfall located downstream - Project would produce environment similar to other lakes in Dalat area with tourism potential - Cold water and deoxygenation could affect Luy River ecosystem downstream of power station outlet - Clearance of project from Forestry Department may be required - Main part of irrigation area already under rice cultivation.	- Downstream effects on Bon Ron Waterfall to be assessed in context of riparian rights and releases required - Reservoir should be completely cleared to improve water quality and scenic attributes - Downstream use of water for urban and domestic supply to be optimised in lower Luy River area - Reuse of tunnel spoil for construction purposes to be assessed - Capacity of Luy River to carry power - station discharges to be confirmed - Watershed management program essential for highland catchment.	Project likely to be environmentally acceptable but would require extensive planning for mitigating actions including those relating to effects on communities along Luy River.
1.2 Don Nai 1,2 & 3 Projects - Dong Nai 1 - 90 MW-36 km^2 Reservoir and 100M head - Dong Nai 2 - 100 MW-38 km^2 Reservoir and 110M Head - Dong Nai 3 - 130 MW-47km^2 Reservoir and 90M Head	- Don Nai 1 damsite right bank and most of reservoir area are degraded pine forests with left bank being bare land - Don Nai 2 and 3 damsites and entire reservoir areas are located in bamboo forests.	- Project reservoir areas are of similar size and mainly within Dong Nai main valley - Reservoir clearing to recover bamboo and residual timber may be possible using river for transportation - Uncertainty exists as to whether any Special Use Forest (Protected Areas) are involved - Access roads to site could promote illegal cutting of forests in protected areas.	- Reservoir clearing recommended - Site access roads to have controlled access (eg policing by Forest Control Department) - Watershed management program to be integrated with Production and Protection Forest administration - Tourism potential to be assessed and long term development plan integrated into any of three (3) projects - Site status re: Forest Reserves need to be determined as a priority.	Potential effects of projects require detailed EIAs and rationalisation based on effects and implementable mitigating actions.

Table 8.1 Preliminary Notes, Comments and Environmental Assessment for Main Dam/Reservoir Projects to be Considered in Dong Nai Master Plan Study (2/4)

PROJECT LOCATION, SIZE AND OBJECTIVES	LAND STATUS AND USE AT DAMSITE AND IN RESERVOIR AREA	KEY ENVIRONMENTAL FACTORS AND PROJECT EFFECTS	MITIGATION ACTIONS POSSIBLE OR REQUIRED	ENVIRONMENTAL ACCEPTABILITY
1.3 Don Nai 4 Project - High head (190m) project based on loop by-pass power tunnel - 150~300 MW - 11 km^2 Reservoir - 4.5 km tunnel	- Damsite and reservoir area indicated to be above Cat Tien National Park - Damsite/left bank in bamboo forest and right bank in evergreen forest - Upper part of reservoir zone indicated to be bare land.	- Small reservoir area but two construction sites plus tunnel - Downstream effects on Cat Tien National Park in terms of changes in regime of flood plain and swamp flooding need to be determined - Effects of bypass on main river flows essentially part of and similar to barrier effects of dam on aquatic ecology.	- Need for assessment of reservoir spilling compared with present flood regime downstream - Need for riparian release to be determined (if any) - Location relative to existing or proposed Forest Reserves to be determined in specific details - Riparian vegetation along bypass river section to be assessed re: long term effects.	Project likely to be environmentally acceptable provided detailed EIA and mitigation actions implemented.
1.4 Don Nai 5 & 6 Projects - Dong Nai 5 - 60 MW-10km^2 Reservoir and 80M Head - Don Nai 6 - 320MW-77km^2 Reservoir and 80M Head	- Don Nai 5 located upstream and Don Nai 6 - partially within Cat Tien National Park - Don Nai 5 entire project within bamboo forest - Dong Nai 6 right bank in bamboo forest with residual pockets of evergreen forest and left bank in degraded evergreen forest/shifting cultivation areas.	- Downstream effects of regime changes on Cat Tien National Park/riverine flood plain swamps could be main impact - Reservoir inundated area could be important as wildlife habitat - Reservoir aquatic ecology and fisheries resources likely to be similar to Tri An Reservoir - Effects on local communities uncertain ie minority ethnic groups could be involved.	- Flood season spills to be considered in context of present flood regime - EIAs would require specific wildlife surveys and liaison with Forest Department National Parks and other agencies - Good potential for fisheries development, if reservoirs cleared of vegetation - Resettlement of shifting cultivators would require integration into watershed management plan.	Projects considered to be marginal in terms of environmental acceptability.
1.5 Dong Nai 8 Project - 140 MW - 122.5km^2 Reservoir	- Project directly floods out parts of Cat Tien National Park on right bank of reservoir - Right bank at damsite zone in degraded evergreen forest - Left bank/lower reservoir area is shifting cultivation and upland crops.	- Project would inundate critical wetland habitats in Cat Tien National Park - Detailed wildlife habitat and population surveys required for EIA studies eg. barrier effects - Reservoir aquatic ecology likely to be same as Tri An Reservoir - Access roads plus reservoir likely to promote further intrusions in Cat Tien National Park.	- Effects on Cat Tien National Park are probably not mitigable; so controversy about project could occur with conservation groups - Resettlement program would need to be based on watershed management and reservoir fisheries development - Mitigation in forms of setting aside replacement areas as National Parks could be required.	Project likely to be environmentally controversial and probably unacceptable due to effects on Cat Tien area National Park, one of Viet Nam's most ecologically diverse areas.

Table 8.1 Preliminary Notes, Comments and Environmental Assessment for Main Dam/Reservoir Projects to be Considered in Dong Nai Master Plan Study (3/4)

PROJECT LOCATION, SIZE AND OBJECTIVES	LAND STATUS AND USE AT DAMSITE AND IN RESERVOIR AREA	KEY ENVIRONMENTAL FACTORS AND PROJECT EFFECTS	MITIGATION ACTIONS POSSIBLE OR REQUIRED	ENVIRONMENTAL ACCEPTABILITY
2. SONG BE BASIN 2.1 Can Don 2 Project - 80 MW - 30.0 km^2 Reservoir 2.2 Fu Mieng Project - 60 MW - 70.0 km^2 Reservoir	- Damsite located in upland crop/shifting cultivation and tree crops eg. cashew, pepper vines, rubber - Bare land in reservoir zone under reclamation for tree crops, as above.	- Some residual pockets of riverine bamboo and evergreen forest to be flooded by reservoir - Wildlife resources likely to be minimal and/or degraded - Water quality aspects of reservoir likely dependent on inflows from Thac Mo Reservoir - No villages displaced but families' farms to be inundated - Possible losses in local bamboo forests harvested by locals.	- Potential compensation for farms/tree crops and losses of bamboo need to be assessed - Wildlife survey for EIA probably required to confirm existing situation ie. degraded or not - Fisheries development at reservoir to include households whose land affected - Watershed management plan to be integrated with long term reclamation of bare lands in catchment area.	Project acceptable with good potential for reservoir fisheries and watershed management development.
2.3 Phuoc Hoa Project - 10 MW - 36km^2 Reservoir - Irrigation and water supply to Saigon River by diversion.	- Damsite located in rubber plantation on left bank and in shifting cultivation on right bank - Reservoir area indicated to include shifting cultivation, rubber plantation and single irrigated rice crop areas.	- Compensation and resettlement for 330-350 families required - Reservoir clearing essential to maximise water quality - Effects on wildlife likely to be minimal - Good reservoir fishery potentials.	- Integration of relocatees into reservoir fisheries development - Protection forests on reservoir margins for erosion control are likely to be required - Watershed management plan to be integrated with agroforestry development by Districts.	Project acceptable and needs to include reservoir fisheries development.

Table 8.1 Preliminary Notes, Comments and Environmental Assessment for Main Dam/Reservoir Projects to be Considered in Dong Nai Master Plan Study (4/4)

PROJECT LOCATION, SIZE AND OBJECTIVES	LAND STATUS AND USE AT DAMSITE AND IN RESERVOIR AREA	KEY ENVIRONMENTAL FACTORS AND PROJECT EFFECTS	MITIGATION ACTIONS POSSIBLE OR REQUIRED	ENVIRONMENTAL ACCEPTABILITY
3. LA NGA BASIN 3.1 Ham Thuan & Dam Projects - Ham Thuan - 300 MW - Dami - 172 MW - 6.0 km^2 reservoir	- Projects under detailed Feasibility Study including Environmental Impact Assessment.	- Main effects relate to changes in regime/floodplain inundation and riverine vegetation downstream due to diversion and vegetation and wildlife in reservoir areas.	- Benefits from reservoir fishery much greater than river losses but effects in river zone by-passed could be important to local communities - EIA to be reviewed for La Nga 3 Project implications.	Project likely to proceed and would include watershed management.
3.2 La Nga 3 Project - 60 MW - 23.0 km^2 Reservoir	- Damsite in degraded evergreen forest and shifting cultivation - Residual pockets of undisturbed evergreen forest including riverine forests in reservoir area.	- Potential losses of remaining riverine forests lowest in La Nga catchment - Downstream effects of cumulative changes of La Nga 3 and Hom Thuan/Dami on Bien Loc wetlands need to be assessed including detailed wildlife surveys. - Effects of project on local communities which are relocated eg. Choc-Ro ethnic minority group need to be fully assessed.	- Riparian releases such as in early flood season could be required to minimise downstream effects on Bien Loc swamps - Small scale irrigation development schemes based on local floodplains need to be considered as local mitigation measures - Watershed management and plan needs to include Forestry Department and based on community agroforestry in catchment and Protection Forests and on tourism development in Bien Loc wetlands.	Project has potential environmental effects requiring detailed investigation which could make it uneconomic.

Table 8.2 Reservoir and Watershed Area Distribution in the Dong Nai Basin Main Stream Projects (1/2)

PROJECT	RESERVOIR AREA		WATERSHED AREA		COMMENTS
	PROVINCES	DISTRICTS	PROVINCES	DISTRICTS	
DA NHIM Reservoir Area: Watershed Area: 770 km^2	1. Dalat	Dong Duong	1. Dalat	Don Duong Dalat TP Lac Duong	• Most of watersheds under forest cover. • Intensive use for coffee in western watershed along Dalat/Da Nhim Road No.
DAI NINH Reservoir Area: 19 km^2 Watershed Area: 1,158 km^2 excluding Da Nhim	1. Dalat	Douc Trong	1. Dalat	Don Duong Dalat TP Lac Duong Douc Trong	• 2 Reservoirs involved with Da Nhim sector watersheds has intensive horticulture and coffee. • Da Queyon watershed mostly undermixed pine/evergreen forest.
DONG NAI 1 Reservoir Area: 36 km^2 Watershed Area: 1,869 km^2 excluding Dai Ninh	1. Lam Dong	Lam Ha Di Linh	1. Lam Dong 2. Plus Dai Ninh Project	Lam Ha Di Linh 4 Districts in Dalat Province	• Project viability depends on Fully Supply Level selected for Dong Nai 2 Project. • Narrow reservoir in steep section of Dong Nai River.
DONG NAI 2 Reservoir Area: 38 km^2 Watershed Area: 2,010 km^2 excluding Dai Ninh	1. Lam Dong	Lam Ha Di Linh	1. Lam Dong 2. Dak Lak 3. Plus Dai Ninh Project	Lam Ha Di Linh Dak Nong 4 Districts in Dalat Province	• Dam located east of Road 724 with reservoir backing up into Dong Nai 1 area depending on levels. • Reservoir area mostly evergreen/bamboo forests.
DONG NAI 3 Reservoir Area: 48 km^2 Watershed Area: 2,428 km^2 excluding Dai Ninh	1. Lam Dong 2. Dak Lak	Di Linh Bao Lac Dak Nong	1. Lam Dong 2. Dak Lak 3. Dalat (as for Dai Ninh Project)	Di Linh Bao Lac Lam Ha Dak Nong 4 Districts in Dalat Province	• Upper reservoir area crossed by Road 724. • Largest reservoir project above Cat Tien/Cat Loc Protected Areas. • Reservoir area would need to be cleared to improve water quality aspects.
DONG NAI 4 Reservoir Area: 11 km^2 Watershed Area: 2,597 km^2 excluding Dai Ninh	1. Lam Dong 2. Dak Lak	Bao Lac Dak Nong	Same as above for Dong Nai 3	Same as above for Dong Nai.	• Narrow reservoir with 6 km diversion tunnel to power station at Bon Sa Nu; best hydropower project on Dong Nai.

Table 8.2 Reservoir and Watershed Area Distribution in the Dong Nai Basin Main Stream Projects (2/2)

PROJECT	RESERVOIR AREA		WATERSHED AREA		COMMENTS
	PROVINCES	DISTRICTS	PROVINCES	DISTRICTS	
DONG NAI 5 Reservoir Area: 10 km^2 Watershed Area: 4,263 km^2 excluding Dai Ninh	1. Lam Dong 2. Dak Lak	Bao Lac Cat Tien Dak Plaf	1. Lam Dong 2. Dak Lak 3. Dalat (as for Dai Ninh Project)	Same as above for Dong Nai 3 plus Cat Tien. Same as above for Dong Nai 3 plus Dak Plap.	• Project affects Cat Loc Protected Area which is for endangered Javan rhinocerous. • Narrow, long reservoir with firm power potential if preceded by Dong Nai 3 and 4 projects.
DONG NAI 6 Reservoir Area: 77 km^2 Watershed Area: 5,118 km^2 excluding Dai Ninh	1. Lam Dong 2. Dak Lak 3. Song Be	Cat Tien Dak Plaf Bu Bang	1. Lam Dong 2. Dak Lak 3. Song Be 4. Dalat (as for Dai Ninh Project)	Same as for Dong Nai 4 - Bu Bang 3 districts in Dalat Province.	• Project seriously affects Cat Loc Protected Area and is probably environmentally not acceptable. • Reservoir area intrusion for logging operations based on Cat Tien and Tong Nhat.
DONG NAI 8 Reservoir Area: 122 km^2 Watershed Area: 7,889 km^2 excluding Dai Ninh	1. Lam Dong 2. Dong Nai	Da Hociai Ha Le Tan Phu	1. Lam Dong 2. Dak Lak 3. Song Be 4. Dong Nai 5. Dalat (as for Dai Ninh Project)	Same as for Dong Nai 6 Tan Phu 4 Districts in Dalat Province	• North west sector of reservoir floods Southeast corner of Cat Tien National Park. • Reservoir probably floods last remaining lowland riverine forest below Cat Tien area swamps.

Table 9.1 IEE Requirements for Proposed Projects Considered for Master Plan

Code No.	Project / Program Title	Necessary IEE	Not Necessary IEE	Not Complete Project
D-00	**Projects Involving Reservoir Construction**			
D-01	Dong Nai No.3 Hydropower Project	○		
D-02	Dong Nai No.4 Hydropower Project	○		
D-03	Dong Nai No.6 Hydropower Project		○*	
D-04	Dong Nai No.8 Hydropower Project		○*	
D-05	Fu Mieng Multipurpose Project	○		
D-06	Can Don Hydropower Project		○*	
D-07	Luy Irrigation Reservoir Project	○		
I-00	**Irrigation Development / Rehabilitation Projects**			
I-01	Rural Agricultural Development Project	○		
I-02	Song Be - Dau Tieng Diversion Project	○		
I-03	Phan Ri - Phan Thiet Irrigation Project	○		
I-04	Lower La Nga Plain Irrigation Project	○		
I-05	HCMC - Long An Delta Agricultural Development Project	○		
W-00	**Water Supply Projects**			
W-01	HCMC - Bien Hoa - Vung Tau Water Supply Pipeline Project			○

Note : * Indicates project for which EIA is complete or in progress under commission of PIDC 2.

Table 9.2 Basic Environmental Impact Matrix for Screening for IEE (1/7)

(1) Name of the Project : Dong Nai No.3 Hydropower Project

Environmental Impacts of the Project	Pre-Construction Stage (before the Construction)	Construction Stage (during the Construction)	Operation Stage (after the Construction)
Natural Environment			
- Topography	×	▽-	×
- Soil erosion	×	▽-	▽-
- Ground water	×	▽-	×
- Hydrological situation	×	▽-	○+
- Coastal zone	×	×	×
- Flora & fauna	×	▽-	▽-
Social Environment			
- Population distribution &	×	▽-	▽+
resettlement		No. of households to be affected:	240 (Minorities : Mnong)
		No. of people to be affected :	1,700
- Economic activities	×	▽+	▽+
		Submergible land (ha):	4,800
- Traffic & public facilities	×	▽-	▽+
- Split of communities	×	▽-	×
- Water rights and fishing rights	×	×	×
- Sanitary condition	×	×	×
- Landscape	×	▽-	×
- Natural and cultural assets	×	×	▽-
Public Pollution			
- Air pollution	×	×	×
- Water pollution	×	▽-	×
- Soil contamination	×	×	×
- Noise & vibration	×	▽-	×

(2) Name of the Project : Dong Nai No.4 Hydropower Project

Environmental Impacts of the Project	Pre-Construction Stage (before the Construction)	Construction Stage (during the Construction)	Operation Stage (after the Construction)
Natural Environment			
- Topography	×	▽-	×
- Soil erosion	×	▽-	▽-
- Ground water	×	▽-	×
- Hydrological situation	×	▽-	○+
- Coastal zone	×	×	×
- Flora & fauna	×	▽-	▽-
Social Environment			
- Population distribution &	×	▽-	▽+
resettlement		No. of households to be affected:	?
		No. of people to be affected :	?
- Economic activities	×	▽+	▽+
		Submergible land (ha):	1,100
- Traffic & public facilities	×	▽-	▽+
- Split of communities	×	▽-	×
- Water rights and fishing rights	×	×	×
- Sanitary condition	×	×	×
- Landscape	×	×	×
- Natural and cultural assets	×	×	×
Public Pollution			
- Air pollution	×	×	×
- Water pollution	×	▽-	×
- Soil contamination	×	×	×
- Noise & vibration	×	▽-	×

Notes : ○= Major, ▽= Small, ×= None, + = Positive - =Negative ? = Not Clear

Table 9.2 Basic Environmental Impact Matrix for Screening for IEE (2/7)

(3) Name of the Project : Dong Nai No.6 Hydropower Project

Environmental Impacts of the Project	Pre-Construction Stage (before the Construction)	Construction Stage (during the Construction)	Operation Stage (after the Construction)
Natural Environment			
- Topography	×	×	×
- Soil erosion	×	▽-	×
- Ground water	×	▽-	×
- Hydrological situation	×	▽-	▽+
- Coastal zone	×	×	×
- Flora & fauna	×	○-	○-
Social Environment			
- Population distribution & resettlement	×	▽-	▽+
		No. of households to be affected:	450 (?)
		No. of people to be affected :	2,250 (?)
- Economic activities	×	▽-	▽+
		Submergible land (ha):	7,700
- Traffic & public facilities	×	▽-	▽+
- Split of communities	×	▽-	×
- Water rights and fishing rights	×	▽-	▽-
- Sanitary condition	×	×	×
- Landscape	×	○-	▽-
- Natural and cultural assets	×	○-	○-
Public Pollution			
- Air pollution	×	×	×
- Water pollution	×	▽-	×
- Soil contamination	×	×	×
- Noise & vibration	×	▽-	×

(4) Name of the Project : Dong Nai No.8 Hydropower Project

Environmental Impacts of the Project	Pre-Construction Stage (before the Construction)	Construction Stage (during the Construction)	Operation Stage (after the Construction)
Natural Environment			
- Topography	×	▽-	×
- Soil erosion	×	▽-	▽-
- Ground water	×	▽-	▽-
- Hydrological situation	×	▽-	▽+
- Coastal zone	×	×	×
- Flora & fauna	×	▽-	×
Social Environment			
- Population distribution & resettlement	▽-	○-	○-
		No. of households to be affected:	3,800
		No. of people to be affected :	19,000
- Economic activities	×	○+	▽+
		Submergible land (ha):	12,200
- Traffic & public facilities	×	▽-	▽+
- Split of communities	×	○-	×
- Water rights and fishing rights	×	▽-	▽+
- Sanitary condition	×	▽-	×
- Landscape	×	▽-	×
- Natural and cultural assets	×	▽-	▽-
Public Pollution			
- Air pollution	×	×	×
- Water pollution	×	▽-	×
- Soil contamination	×	×	×
- Noise & vibration	×	▽-	×

Notes : ○= Major, ▽= Small, ×= None, + = Positive - =Negative ? = Not Clear

Table 9.2 Basic Environmental Impact Matrix for Screening for IEE (3/7)

(5) Name of the Project : Fu Mieng Multipurpose Project

Environmental Impacts of the Project	Pre-Construction Stage (before the Construction)	Construction Stage (during the Construction)	Operation Stage (after the Construction)
Natural Environment			
- Topography	×	×	×
- Soil erosion	×	▽-	▽-
- Ground water	×	▽-	×
- Hydrological situation	×	▽-	○+
- Coastal zone	×	×	×
- Flora & fauna	×	▽-	×
Social Environment			
- Population distribution & resettlement	×	▽- No. of households to be affected: 550(Minorities: Kho-me&Xtieng) No. of people to be affected : 2,800	▽-
- Economic activities	▽+	○ Submergible land (ha) : 7,010	▽+
- Traffic & public facilities	×	▽-	▽+
- Split of communities	×	▽-	×
- Water rights and fishing rights	×	▽-	○+
- Sanitary condition	×	×	×
- Landscape	×	▽-	×
- Natural and cultural assets	×	×	×
Public Pollution			
- Air pollution	×	×	×
- Water pollution	×	▽-	▽+
- Soil contamination	×	×	×
- Noise & vibration	×	×	×

(6) Name of the Project : Can Don Hydropower Project

Environmental Impacts of the Project	Pre-Construction Stage (before the Construction)	Construction Stage (during the Construction)	Operation Stage (after the Construction)
Natural Environment			
- Topography	×	×	×
- Soil erosion	×	▽-	▽-
- Ground water	×	▽-	×
- Hydrological situation	×	▽-	▽+
- Coastal zone	×	×	×
- Flora & fauna	×	▽-	×
Social Environment			
- Population distribution & resettlement	×	▽- No. of households to be affected: 13 No. of people to be affected : 65	▽+
- Economic activities	×	▽- Submergible land (ha): 2,900	▽+
- Traffic & public facilities	×	▽-	▽+
- Split of communities	×	▽-	×
- Water rights and fishing rights	×	▽-	▽+
- Sanitary condition	×	×	×
- Landscape	×	▽-	×
- Natural and cultural assets	×	▽-	×
Public Pollution			
- Air pollution	×	×	×
- Water pollution	×	▽-	×
- Soil contamination	×	×	×
- Noise & vibration	×	×	×

Notes : ○= Major, ▽= Small, ×= None, + = Positive - =Negative ? = Not Clear

Table 9.2 Basic Environmental Impact Matrix for Screening for IEE (4/7)

(7) Name of the Project : Luy Irrigation Reservoir Project

Environmental Impacts of the Project	Pre-Construction Stage (before the Construction)	Construction Stage (during the Construction)	Operation Stage (after the Construction)
Natural Environment			
- Topography	×	×	×
- Soil erosion	▽-	▽-	×
- Ground water	×	▽-	×
- Hydrological situation	▽-	▽-	▽+
- Coastal zone	×	×	×
- Flora & fauna	×	▽-	×
Social Environment			
- Population distribution & resettlement	×	▽-	▽+
		No. of households to be affected:	100 (Minorities : Co Ho)
		No. of people to be affected :	500
- Economic activities	×	▽+	×
		Submergible land (ha) :	2,100
- Traffic & public facilities	×	▽+	▽+
- Split of communities	×	▽-	▽-
- Water rights and fishing rights	×	×	×
- Sanitary condition	×	×	×
- Landscape	×	▽-	×
- Natural and cultural assets	×	×	×
Public Pollution			
- Air pollution	×	×	×
- Water pollution	×	×	×
- Soil contamination	×	×	×
- Noise & vibration	×	×	×

(8) Name of the Project : Integrated Rural Irrigation Development Project

Environmental Impacts of the Project	Pre-Construction Stage (before the Construction)	Construction Stage (during the Construction)	Operation Stage (after the Construction)
Natural Environment			
- Topography	×	×	×
- Soil erosion	×	×	○+
- Ground water	×	×	▽+
- Hydrological situation	×	×	▽+
- Coastal zone	×	×	▽+
- Flora & fauna	×	▽-	×
Social Environment			
- Population distribution & resettlement	×	▽-	▽+
		No. of households to be affected:	?
		No. of people to be affected :	?
- Economic activities	×	○+	○+
- Traffic & public facilities	×	▽-	○+
- Split of communities	×	▽-	▽-
- Water rights and fishing rights	×	▽-	○+
- Sanitary condition	×	○+	○+
- Landscape	×	▽-	×
- Natural and cultural assets	×	×	×
Public Pollution			
- Air pollution	×	×	×
- Water pollution	×	▽-	○+
- Soil contamination	×	×	▽-
- Noise & vibration	×	▽-	×

Notes : ○= Major, ▽= Small, × = None, + = Positive - =Negative ? = Not Clear

Table 9.2 Basic Environmental Impact Matrix for Screening for IEE (5/7)

(9) Name of the Project : Song Be - Dau Tieng Diversion Project

Environmental Impacts of the Project	Pre-Construction Stage (before the Construction)	Construction Stage (during the Construction)	Operation Stage (after the Construction)
Natural Environment			
- Topography	×	×	×
- Soil erosion	×	×	▽+
- Ground water	×	×	○+
- Hydrological situation	×	×	○+
- Coastal zone	×	×	×
- Flora & fauna	×	▽-	×
Social Environment			
- Population distribution & resettlement	×	▽- No. of households to be affected: ? No. of people to be affected : ?	▽+
- Economic activities	×	○+	○+
- Traffic & public facilities	×	○+	○+
- Split of communities	×	▽-	×
- Water rights and fishing rights	×	×	○+
- Sanitary condition	×	○+	○+
- Landscape	×	▽-	×
- Natural and cultural assets	×	×	×
Public Pollution			
- Air pollution	×	×	×
- Water pollution	×	▽-	○+
- Soil contamination	×	×	▽+
- Noise & vibration	×	▽-	×

(10) Name of the Project : Phan Ri - Phan Thiet Irrigation Project

Environmental Impacts of the Project	Pre-Construction Stage (before the Construction)	Construction Stage (during the Construction)	Operation Stage (after the Construction)
Natural Environment			
- Topography	×	×	×
- Soil erosion	×	×	○+
- Ground water	×	×	○+
- Hydrological situation	×	×	○+
- Coastal zone	×	×	▽+
- Flora & fauna	×	▽-	▽-
Social Environment			
- Population distribution & resettlement	×	▽- No. of households to be affected: ? No. of people to be affected : ?	▽+
- Economic activities	×	○+	○+
- Traffic & public facilities	×	○+	○+
- Split of communities	×	▽-	×
- Water rights and fishing rights	×	×	○+
- Sanitary condition	×	▽-	○+
- Landscape	×	▽-	×
- Natural and cultural assets	×	▽-	×
Public Pollution			
- Air pollution	×	×	×
- Water pollution	×	▽-	○+
- Soil contamination	×	×	▽+
- Noise & vibration	×	▽-	×

Notes : ○= Major, ▽= Small, × = None, + = Positive - =Negative ? = Not Clear

Table 9.2 Basic Environmental Impact Matrix for Screening for IEE (6/7)

(11) Name of the Project : Lower La Nga Plain Irrigation Project

Environmental Impacts of the Project	Pre-Construction Stage (before the Construction)	Construction Stage (during the Construction)	Operation Stage (after the Construction)
Natural Environment			
- Topography	×	×	×
- Soil erosion	×	×	○+
- Ground water	×	×	○+
- Hydrological situation	×	×	○+
- Coastal zone	×	×	×
- Flora & fauna	×	▽-	▽-
Social Environment			
- Population distribution & resettlement	×	▽-	×
		No. of households to be affected:	?
		No. of people to be affected :	?
- Economic activities	×	○+	○+
- Traffic & public facilities	×	○+	○+
- Split of communities	×	▽-	▽+
- Water rights and fishing rights	×	×	○+
- Sanitary condition	×	▽+	○+
- Landscape	×	▽-	×
- Natural and cultural assets	×	▽-	×
Public Pollution			
- Air pollution	×	×	×
- Water pollution	×	▽-	○+
- Soil contamination	×	×	▽+
- Noise & vibration	×	▽-	×

(12) Name of the Project : HCMC - Long An Delta Agricultural Development Project

Environmental Impacts of the Project	Pre-Construction Stage (before the Construction)	Construction Stage (during the Construction)	Operation Stage (after the Construction)
Natural Environment			
- Topography	×	×	×
- Soil erosion	×	×	×
- Ground water	×	×	×
- Hydrological situation	×	×	○+
- Coastal zone	×	▽-	▽+
- Flora & fauna	×	▽-	×
Social Environment			
- Population distribution & resettlement	×	▽-	×
		No. of households to be affected:	?
		No. of people to be affected :	?
- Economic activities	×	○+	○+
- Traffic & public facilities	×	○+	○+
- Split of communities	×	×	×
- Water rights and fishing rights	×	×	▽+
- Sanitary condition	×	▽-	○+
- Landscape	×	▽-	×
- Natural and cultural assets	×	×	×
Public Pollution			
- Air pollution	×	×	×
- Water pollution	×	▽-	○+
- Soil contamination	×	×	▽+
- Noise & vibration	×	×	×

Notes : ○= Major, ▽= Small, ×= None, + = Positive - =Negative ? = Not Clear

Table 9.2 Basic Environmental Impact Matrix for Screening for IEE (7/7)

(13) Name of the Project : HCMC-Bien Hoa-Vung Tau Water Supply Pipeline Project

Environmental Impacts of the Project	Pre-Construction Stage (before the Construction)	Construction Stage (during the Construction)	Operation Stage (after the Construction)
Natural Environment			
- Topography	×	×	×
- Soil erosion	×	▽-	×
- Ground water	×	▽-	×
- Hydrological situation	×	▽-	○-
- Coastal zone	×	×	○-
- Flora & fauna	×	×	×
Social Environment			
- Population distribution & resettlement	×	▽-	×
		No. of households to be affected : ?	
		No. of people to be affected : ?	
- Economic activities	▽+	▽+	○+
- Traffic & public facilities	×	○+	○+
- Split of communities	×	▽-	▽-
- Water rights and fishing rights	▽-	▽-	▽-
- Sanitary condition	×	▽-	○-
- Landscape	×	▽-	×
- Natural and cultural assets	×	×	×
Public Pollution			
- Air pollution	×	×	×
- Water pollution	×	▽-	○-
- Soil contamination	×	×	×
- Noise & vibration	×	▽-	×

Notes : ○= Major, ▽= Small, ×= None, + = Positive - =Negative ? = Not Clear

Table 9.3 Comparision of Main Effects of Song Luy Reservoir Options

Project Features and Environmental Criteria	Downstream Site A-A	Upstream Site B-B
1. Location/Catchments	Across Song Luy and includes 200 km^2 Da Ke Trou catchment	Across Song Matin and excludes Da Ke Trou catchment
2. Dam length	1,950 m	2,600 m
3. Assumed Full Supply Level	130 mase	140 mase
4. Reservoir area at FSL	18 km^2 (6.5 km^2 in Da Ke Trou)	21 km^2 (excluding Da Ke Trou)
5. Number of communities & poultation in reservoir	6 - 7 communities with 200 - 240 families	12 - 13 communities with 300 - 350 families
6. No of traditional use areas likely to be affected	12 communities	14 communities
7. Number & Length of local access tracks affected	6 tracks - 23 km including 12 km main track along Da Ke Trou river.	7 tracks - 22 km including 5.5 km main track along Song Matin river.
8. Length of proposed access road to Dai Ninh 2 Project power station affected	4.5 km	5.7 km
9. Other key issues	- Relocation of access road to Dai Ninh Project presents little problem. - Probably main ethnic groups involved are Co Ho and Cham. - Most of area to be flooded is upland, crops and grassland.	- Access relocation road to Dai Ninh Project could be 10 - 12 km; 50% through steep topography. - Could involve three ethnic groups; Co Ho, Cham and Ra-glai. -Most of area to be flooded is upland crops, grassland and secondary regrowth (bamboo).

Note: All information above is preliminary being based on site visits, map interpretation and discussion with Study Team members and Environmental Study Team for Dai Ninh project.

ATTACHMENT

ATTACHMENT A

LIST OF AGENCIES AND PERSONS CONTACTED RELATING TO ENVIRONMENTAL ASPECTS OF DONG NAI BASIN MASTER PLAN STUDY

1. Ministry of Health - Institute of Hygiene and Public Health (IHPH)

   - Dr Cao Minh Chanh - Director
   - Dr Ho Hai - Vice Director
   - Dr Nguyen Van Ba - Chief, Environmental Health
   - Dr Vu Trong Then - Chief, Community Health

2. Viet Nam National Centre for Natural Science and Technology-Sub-Institute of Ecology and Biological Resources (IEBR)

   - Professor Dr Duon Canh - Director
   - Mr Truong Quang Tam - Forestry Engineer

3. Institute for Tropical Technology and Environmental Protection of Viet Nam - Environment Protection Centre (EPC)

   - Dr Le Tu Trinh - Director

4. Environment Committee of Ho Chi Minh City (ENCO)

   - Mr Pham Thanh Phuong - Vice Chief

5. Ministry of Forestry - Forestry Inventory & Planning Institute (FIPI-II)

   - Mr Ngo Ut - Assistant Director, Chief Technical Section
   - Mr Nguyen Chi Thanh - Chief, Planning Section
   - Mr Hoang Dung - Forest Ecology and Planning Specialist

6. Ministry of Fisheries and Aquatic Products - Research Institute for Aquaculture No. 2 - (RIA 2)

   - Dr Nguyen Viet Thang - Vice Director
   - Mr Nguyen Van Trong - Head, Division of Environment and Fisheries Resources
   - Mr Tran Truong Luu - Senior Researcher

ATTACHMENT B

REVIEW OF ENVIRONMENTAL IMPACT ASSESSMENT (EIA) REGISLATION IN VIET NAM AS RELATED TO DONG NAI BASIN MASTER PLAN AND OTHER WATER RESOURCE PROJECTS

B.1 Background

Policies, legislation and attendant procedures relating to Environmental Impact Assessment (EIA) were issued by the Ministry of Science, Technology and Environment (MOSTE) mainly in late 1994 and early 1995. As a consequence the following situation currently applies (ie. June 1995):

(1) Limited expertise and experience in EIA at the central level in the newly formed National Environment Agency (NEA) under the MOSTE.

(2) Very limited expertise and experience in EIA process and environmental planning and protection in the provincial offices of Science Technology and Environment (eg. complete reliance on environmental consultants to formulate provincial protection plans and legislation).

(3) Jurisdictional conflict over environmental planning and protection responsibilities in Ho Chi Minh City where the Environmental Committee (ENCO) predates the new legislation has issued standards different than those of MOSTE and has been reviewing and approving EIAs now legislated as the responsibility of the Central MOSTE/NEA.

There is an indicated lack of understanding of the environmental planning and impact assessment applicable to major water resource development projects. To this extent the Ham Thuan-Da Mi Project may be a leading "test case" for Appraisal of such an EIA by the Central MOSTE.

B.2 Current Status of Environmental Laws and Regulations

The following laws, decrees, regulations and guidelines have been issued relating to environmental protection:

(1) 27 December 1993 - Law on Environmental Protection passed by National Assembly of GOV.

(2) 10 January 1994 - Announcement of Law on Environmental Protection by Presidential Decision No. 29 L/CTN.

(3) 18 October 1994 - Government Decree on Providing Guidance for Implementation of Law on Environmental Protection by GOV Decree No. 175 KP.

(4) 26 December 1994 - Ministerial Instruction for Guiding Environmental Impact Assessment for [Existing] Operating Units by MOSTE Instruction No. 1420/QD-MTg.

(5) 31 December 1994 - Ministerial Regulations and Organisation of Appraisal Council on Environmental Impact Assessment and Issuing Environmental Licenses by MOSTE Ministerial Decisions No. 1806 and 1807/QD-Mtg.

(6) 3 April 1995 - Ministerial Instruction for Guidance on Setting Up and Appraising the Report of Environmental Impact Assessment for the Direct Foreign Investment Project.

English translations albeit with several errors in each) for items (3) through (6) are included in a recently issued MOSTE publication entitled "Documents of Setting Up a Report on Environmental Impact Assessment" dated Hanoi, 1995; (65 pages).

B.3 Summary of Contents of EIA Legislation

Decree No. 175/CP Guidance for Implementation of Law on Environmental Protection.

The main relevant legislation is GOV Decree No. 175/CP relating to guidance for Implementation of Law on Environmental Protection which is summarised as follows:

B.3.1 Chapter I - General Provisions

Article 1 - Refers to Law on Environmental Protection

Article 2 - Refers to Decree's No. 175/CP's applicability "to all foreign organizations and individuals living and working in Viet Nam"

Article 3 - Refers to Decree No. 175/CP's applicability to international treaties and provision for such treaties to apply if different to Decree No. 175/CP.

B.3.2 Chapter II - Distribution of Responsibilities for Environmental Protection

Article 4 - Refers to responsibilities of MOSTE including Item 1) i relating to "all proposals on the participation of international organizations to carry out activities relating to environmental protection."

Article 5 - Refers to responsibilities of other Ministries to comply with Decree No. 175/CP including setting own strategies and policies (Item 1a) and coordinating EIA reports for projects within their responsibilities (Item 1 d) - presumably including any projects funded or partially funded with foreign assistance.

Article 6 - Refers to the responsibilities and roles of provincial and city People's Committees and provincial offices of Science Technology and Environment "for the implementation of management of environmental protection" including the appraising of EIA reports.

Article 7 - Refers to the environmental protection responsibilities of "state offices and mass associations of peoples" (eg. unions) to comply with laws and regulations and promote environmental education.

Article 8 - Refers to need for compliance with all environmental protection laws and regulations by "all production and business organizations".

B.3.3 Chapter III - Assessment of Environmental Impact

Article 9 - Refers to responsibilities of project managers and directors to undertake EIA for different types of projects including:

- "Overall strategies for regional development" (Item 1)
- "Projects being carried out with funds invested, assisted, granted or contributed by foreign organizations ....." (Item 3)
- Requires that projects relating to Items 1 and 3 undertake EIA even if approved before 10 January 1994; ie. the date of Announcement of Law on Environmental Protection (Item 4).
- Provides for special case of certain types of projects commenced before 10 January 1994 (Item 5).

Article 10 - Refers to the general scope of aspects to be covered in EIA and the need for a separate "Report on Environmental Impact Assessment."

Article 11 - Refers to need for all new projects after 10 January 1994 to undertake both "Preliminary" and "Detailed" Reports on EIA.

Article 12 - Refers to the need for EIA methods to be of "current international standards" and to be based on Vietnamese environmental standards (yet to be fully published).

Article 13 - Refers to the need for Reports on EIA to be comprised of the Report on EIA and a "dossier" of project documents and related appendices for these to be submitted in three copies and for these documents for foreign funded projects that "the documents should be in Vietnamese (Item 1 and 3). Note: This is an excessive requirement, which is not practical in the case of many technical reports; particularly those relating to major highly technical projects such as dams, reservoirs, power stations, etc.).

Article 14 - Refers to the division of responsibilities for appraising different types and sizes of projects between the Central MOSTE and the provincial Offices of Science Technology and Environment (OSTE).

Article 15 - Refers to the ways and means for appointing EIA "Appraising Councils" at the MOSTE and OSTE levels.

Article 16 - Refers to the period of time for appraising Reports on EIA; these being 2 months from date of receipt of all related documents and/for the appraisal to be n harmony with the period of time prescribed for issuing investment licenses" for foreign funded or assisted projects as per Article 9.

Article 17 - Refers to the general responsibilities of authorities (ie. MOSTE and OSTE) to consider and incorporate environmental protection measures suggested by Appraising Council for Reports on EIA.

Article 18 - Refers to rights and period (ie. 3 months) of appeal by project proponents if "they do not agree with the conclusions of the Appraising council".

Article 19 - Refers to the rights of projects under the Ministries of Defence and Interior to be assessed and appraised by the respective Ministry directly in co-operation with MOSTE.

Article 20 - Refers to the required co-operation with MOSTE for completing EIA and its appraisal for projects existing prior to 10 January 1994.

B.3.4 Chapter IV - Prevention, Restoring and Overcoming Environmental Deterioration, Pollution and Incidents

Article 21 - Refers to procedures required for permission to use parts of national parks, nature reserves and other protected areas.

Article 22 - Refers to the need for all operations affecting the environment to comply with Vietnamese environmental standards including a basic list of 20 "standards". NOTE: These 20 "standards" are yet to be drafted and approved as regulations by MOSTE.

Article 23 - Refers to the need for permission from appropriate authorities relating to the "exporting and importing certain species of animals, vegetation (including seeds); micro-organisms and gene sources" and for compliance with CITES agreements including example (but outdated) lists.

Article 24 - Refers to the need for permission from appropriate authorities relating to the "export or import of toxic chemicals and biological products".

Article 25 - Refers to the need for permission/approval by appropriate authorities relating to the "import of complete equipment and technology" including the role of MOSTE in approving importation of environmental protection equipment.

Article 26 - Refers to the need for all transportation equipment to meet defined air emission standards and noise levels.

Article 27 - Refers to the need for compliance by all production and business establishments relating to solid, liquid and gas wastes to meet treatment and disposal standards set by relevant authorities.

Article 28 - Refers to the prohibition of the "import or export of discharged substances (waste materials) containing toxic elements or pathogenic microbes" and the role of MOSTE in providing guidance relating to this matter.

Article 29 - Refers to prohibition "of production, transportation, trading, storage and use" of fireworks effective 1 January 1995.

Article 30 - Refers to the responsibilities and roles of MOSTE relating to advice on "especially serious cases of environmental incidents" and any required "urgent measures of treatment."

Article 31 - Refers to the arrangements for recovery of costs required to overcome environmental incidents.

B.3.5 Chapter V - Financial Sources for Environmental Protection Tasks

Article 32 - Refers to sources for financing environmental protection, as being from State budget allocations (Item 1); fees for Report on EIA and resource use for production or business as stipulated by Ministry of Finance (Item 2) and other sources such as fines (Item 3).

Article 33 - Refers to establishment of a "National Reserve Fund operated by MOSTE for dealing with environmental deterioration, pollution and incidents" and sources including state budgets, contributions from joint-ventures with foreigners and internal and external organizations promoting environmental protection.

Article 34 - Refers to the types of organizations and individuals (both domestic and foreign) which have to pay environmental protection fees and provides for the roles of MOSTE and Ministry of Finance in fee collection.

Article 35 - Refers to the general types of environmental protection tasks which will be funded annually.

Article 36 - Refers to joint responsibility of MOSTE and Ministry of Finance to manage funds collected and distributed for environmental protection.

B.3.6 Chapter VI - Inspection of Environmental Protection

Article 37 - Refers to the responsibilities and roles of MOSTE relating to the implementation of environmental protection laws and regulations including the monitoring of subsidy agencies (Item 1) and compliance inspections for organizations and individuals (Item 2).

Article 38 - Refers to joint responsibilities between MOSTE and the State's General Inspector to stipulate the inspectorial power and scope of activities.

B.3.7 Chapter VII - Provisions for Implementation

Article 39 - Refers to effective date of GOV Decree No. 175/CP and repeals previously issued environmental regulations.

Article 40 - Refers to obligations of various Ministries and other GOV agencies People's Committees to provide co-operation and guidance for implementing Decree No. 175/CP.

B.3.8 Appendices

Appendix I-1	-	Contents for Preliminary Report on EIA
Appendix I-2	-	Contents for Detailed Report on EIA
Appendix I-3	-	Content for Report on EIA for Operating Units
Appendix II	-	Appraisal Responsibilities for Report on EIA Between MOSTE and OSTE
Appendix III	-	List of Protected Forest Plants and Animals (Out of Date)
Appendix IV	-	Emission Standards for Existing Vehicles and New Vehicles
Appendix V-1	-	Permitted Vibrations
Appendix V-2	-	Vibrations in Each Octave Range
Appendix V-3	-	Noise Standards for Vehicles
Appendix V-4	-	Noise Standards for Urban Areas

B.3.9 Instruction No. 1420/QA-MTg - Instruction for Guidance for Environmental Impact Assessment to Operating Units

Instruction No. 1420/QD-MTg has little relevance to the Dong Nai Basin Masterplan as it relates mainly to manufacturing and processing operations in existence prior to 10 January 1994 and includes provisions for foreign funded or assisted projects to prepare Detailed Reports on EIA under Article 9: Item 3 of Decree 175/CP.

B.3.10 Decisions No. 1806 and 1807/QD-MTg-MOSTE Regulations and Organization of Appraisal Council on Environmental Impact Assessment and Issuing of Environmental Licences

These regulations primarily relate to the setting up, and operational methods for the Appraisal Council(s) to be appointed by MOSTE for evaluating and approving Reports on EIA.

Article 7 of Decision 1807/QD-MTg contains a requirement that "All appraisal certificates should give a clear schedule, content and requirement for the investment to be undertaken to mitigate all environmental issues given in the EIA". This requirement could have substantial implications in respect of major water resource projects involving compensation for losses of natural resources (eg. forest and wildlife); resource use rental payments (eg. for water) and compensation and resettlement programs, if some criteria included and advocated as applicable in "international EIA guidelines" such as those of the World Bank are to be complied with as legislated under Article 12 of Decree 175/CP noted above. For example World Bank "EIA guidelines require due consideration of watershed management programs and associated cost as part of reservoir projects".

B.3.11 Instruction No. 715/QD-MTg-Instruction for Guidance on Setting Up and Appraising the Report on EIA for Direct Investment Projects

This Instruction has little relevance to the Dong Nai Basin Masterplan Study but could be of interest to JICA in relation to other bilateral aid projects which are being promoted as or could eventually involve financing being sought on the basis of build Own Operate Transfer (BOOT). This would bring into effect the various requirements involving approvals for environmental protection and compliance at the Application for Investment License, Design and Construction and Construction Completion stages as required under Instruction No. 715/QD-MTg relating to "direct investment projects". Provided a proper Report on EIA is included in the particular project's Feasibility Study program, this should not present any undue problems in JICA promoting BOOT schemes in Viet Nam because of environmental protection legislation.

B.4 Implications of EIA Legislation to Dong Nai Basin Masterplan Study

The recently promulgated environmental laws and regulations outlined above give rise to some uncertainty as to the final approach to be adopted for environmental impacts to the Dong Nai Basis Masterplan Report, as follows:

(1) The applicability of requirements under Article 9 (Item 3) relating to "Projects being carried out with funds granted or contributed by foreign organizations" being required to prepare an EIA depend on whether a "masterplan" is a "project" or not. In discussions with MOSTE's National Environmental Agency in Hanoi it was pointed out that environmental considerations were being incorporated into the planning process for optimising and prioritising water resource development and that IEEs of the recommended priority projects would be included. This seems to be accepted and the need not to produce a separate EIA Report was also agreed. It was indicated that the Environmental Section of the Dong Nai Basin Masterplan Report should be self-contained

so it could be extracted and appraised by MOSTE. This could prove difficult in the context of the proposed Interim Report format.

(2) There are several sub-projects which would be included in the Dong Nai Masterplan which would obviously require full scale EIA Reports when they are further investigated at the Feasibility Study level (eg. reservoir and irrigation projects as defined in Appendix II of Decree 175/CP). However there could also be several types of projects such as flood control works for which there are not yet any requirements to assess environmental impacts. Summary notes outlining the types and scope of projects requiring EIA based in Decree 175/CP are included as Section 6.5. Clarification as to which projects included in the Masterplan required EIA to be prepared should be undertaken during Final Report stage and those duly notes in the Masterplan.

(3) General reference only should be made to the MOSTE guidelines on Report on EIA in order not to confuse the issue or to imply that the "environmental component" of the Masterplan is in effect an EIA and can be extracted for separate evaluation outside the context of the overall Masterplan report. NOTE: If MOSTE were to claim that a Report on EIA is required, then the whole problem of EIA international standards, submitting application for appraisal, translating documents into Vietnamese and awaiting appraisal results, as referred to in Articles 12, 13 and 16 above could affect the final review and approval of the Masterplan.

In view of the above, it is suggested that environmental inputs to the Masterplan proceed as planned unless JICA insists that this matter be explicitly resolved with the Ministry of Water Resources and MOSTE.

B.5 Scope of Projects Requiring Detailed EIA and Appraisal by National Environmental Agency (NEA) under MOSTE Decrees and Guidelines (March 1995)

The following water resource related projects are specified or indicated as requiring EIA under the present MOSTE legislation and guidelines:

(1) Dam and reservoir projects with active storage capacity exceeding 100 million m^3/year.

(2) Irrigation project with water use exceeding 100 million m^3/year.

(3) Power transmission lines exceeding 100 kV.

(4) Resettlement program involving more than 500 households.

(5) Plantation or industrial forestation project exceeding 2000 ha (eg. for watershed protection).

(6) Construction materials factory (borrow areas?) which are large or medium scale.

(7) Projects affecting more than 500 ha of alluvial plain (flood control schemes).

(8) There are no specific requirements for:

- run-of-river hydro schemes not involving storage reservoirs
- flood control works such as protection dykes, river training works, dredging, river diversions etc.
- salinity barrages
- dredging for river navigation or for removal of river bed construction material
- water supply and sewerage projects.

(9) Water supply schemes (presumably including associated pipelines) appear to be exempted from EIA according to Appendix I of Guidance on Setting up and Appraising EIA to Direct Foreign Investment Projects.

(10) Water resource projects involving components smaller than those indicated in Item (1) to (7) inclusive above still require an EIA which would be subject to Appraisal by the relevant provincial Offices of Science Technology and Environment under Article 14 of the EIA Guidelines.

ATTACHMENT C

PRELIMINARY EVALUATION OF EFFECTS OF DONG NAI NO. 8 ON NAM CAT TIEN NATIONAL PARK

C.1 *Zone from Ta Lai Upstream*

With a Full Supply Level of 120 m and minimum operating level of 100 m, Dong Nai No. 8 reservoir would have several effects on Nam Cat Tien Park under its presently declared boundaries. These impacts for that zone of the Park above Ta Lai (Song Tapoh) include:

(1) Regular seasonal inundation of some 2.5 km of the riverine fringe community on the right bank of Dong Nai River north from the river rapids complex upstream of Ta Lai with the width flooded not exceeding 100 m (i.e. an indicated habitat loss of 10 to 15 km^2 based on 1:10,000 topographic map series for Dong Nai No. 8 project.

(2) Backwater effects resulting in higher river levels within its natural floodplain in the southern sector of the Park during the period when the Dong Nai No. 8 reservoir remains at Full Supply Level indicate to extend for 10 to 12 km upstream of Ta Lai for 1.5 to 2.0 months each year during the October-January period (based on reservoir level 1989-1993 data).

(3) Alterations to the fish population in the Dong Nai River in the southern sector of the Park due to the barrier effects and downstream reservoir for Dong Nai No. 8 project; an effect which would be limited mainly to changes in species distribution rather than overall productivity.

(4) Loss of the Ta Lai rapids and sand bar/island complex and any associated recreational potentials due to flooding and sedimentation in this upstream reach of the Dong Nai No. 8 reservoir area.

C.2 Ta Lai and Downstream Zone

The impacts of that sector of Nam Cat Tien National Park including and downstream of Tai Lai would be permanent and adversely affect that sector of the Park and would include:

(1) Flooding of a substantial position of the designated "habitat restoration zone" located in the southeast sector of the Park and currently covered by scrub mixed forest including bamboo, plantation and agricultural land.

(2) Loss of some 10 to 12 km of Dong Nai River aquatic habitat and residential residual forest on the right bank; to be replaced with a fluctuating reservoir and seasonal and barren drawdown zone varying in width from 200 m to over 1.0 km. Such areas are of limited value either as wetland habitat or for access by wildlife to the reservoir because they are primarily comprised of silts and sand; being located in the upper reaches and sedimentation accumulation zone of the reservoir.

(3) Existence of the reservoir, particularly when at higher levels so Ta Lai rapids are inundated combined with displacement of people from the reservoir area, creates a situation more favourable for boat access into the Park for exploitation of forest products and wildlife. This is a common problem where new reservoirs are located in areas where unexploited forests exist, not only in Viet Nam but throughout Southeast Asia.

C.3 Mitigating Measures Relating to Dong Nai No. 8 Project

The options for mitigating measures other than limiting the Full Supply Level to an elevation below 100 m EL are indicated to be limited. With a lower FSL, the community of Ta Lai and rapids upstream would not be flooded; thereby continuing to act as a barrier to boat travel into the lower sector of Nam Cat Tien National Park. A lower FSL such as 100 m would also reduce the extent of the "habitat restoration zone" lost due to flooding and would leave the riverine vegetation and scenic values of the Ta Lai rapids intact.

It is suggested that any GOV decision to eliminate further consideration of Dong Nai No. 5 and 6 projects, which would completely destroy the riverine habitat of the Cat Loc Nature Reserve (i.e. long term Northern Component of Cat Tien National Park) should be a conditional measure, if Dong Nai No. 8 project is to proceed with Full Supply Levels above 100 m elevation (refer to Section 8.3 above); that is, if Dong Nai No. 8 proceeds as planned, Dong Nai No. 5 and 6 should not be considered further.

If the Dong Nai No. 8 project proceeds at FSL 120 m, the following mitigating measures should be considered:

(1) Extending the south-eastern part of Nam Cat Tien National Park to include lands currently indicated as "buffer zone", including making the FSL the boundary of the Park; so that effective controls on land use and boat access to this sector can be included as responsibilities of Park management.

(2) Providing Park management with an allocation of funds from the electricity revenue for establishing and operating protection and rehabilitation measures for reservoir shorelands and drawdown zone in the Park, including any wildlife management problems (e.g. rescue of animals stranded on islands due to reservoir operations).

(3) Minimising the number of villagers relocated on shoreland sectors opposite the Cat Tien National Park in order to minimise exploitation of its resources.

ATTACHMENT D

SOCIOECONOMIC PROFILE FOR THE DAK PLAO COMMUNITY

(Based on Brief Discussion with Dac Nong District Representatives Assigned to Assist Peoples' Committeeof Dak Plao Commune)

D.1 Population and Economic Group

1.1 Community consists of 224 households, many of which are extended families residing in three locations within the commune.

1.2 Total 1995 population is 1595 persons or an average of 7.1 persons/ household with about 705 persons or 44% under 15 years of age.

1.3 Historically and presently the community consists mainly of Mnong; an ethnic minority resident of Viet Nam's central highlands with an estimated 1995 national population of approximately 80,000.

1.4 Mnong along with small populatins of other ethnic minority groups is present in Quang Khe (255 families) and B'sre (88 families) and scattered houses along the access road from Gia Nhgia to Dak Plao.

1.5 Four (4) Tay families have recently moved into the Dak Plao community area.

D.2 Agricultural Activities

2.1 Shifting cultivation for upland rice and maize is the main traditional crops plus 17 ha of paddy existing in Dak Plao. Rice is imported from Gia Nghia for barter and as donations under food deficiency relief programmes.

2.2 Coffee as a cash crop has been planted since the year 1987 with 51 ha presently under private cultivation by residents and 18 ha being developed jointly by the District Forest Office and a HCMC private company previously involved with timber activities in the area.

2.3 Agricultural produce (coffee) and collected forest products are traded externally both to Dak Nong and across the Dong Nai River into Bao Loc district; Lam Dong province.

D.3 Infrastructure, Health and Services Available

3.1 A small irrigation reservoir was constructed two years ago at a cost of VND 100 million and maintains the access road.

3.2 Two elementary schools with 14 teachers and 350 student with secondary and senior high school students required to go to Gia Nghia but nobody has done so, as yet.

3.3 No health care facilities or services are located in Dak Plao, but spraying of houses for malaria control and visits by District Health Staff occur irregularly.

3.4 A World Bank funded community base's "Primary Health Care Project" (1996) for Dak Nong Province will include Dak Plao and focus on post-natal and infant case and family planning.

3.5 A community water supply project using a nearby spring was developed by UNICEF in the year 1994.

3.6 Agricultural extension services are limited with visits by District Agriculture Officers being infrequent.

D.4 Community Development Priorities

4.1 Improved access road to Dak Nong and extension for 2.5 km to the Dong Nai River,

4.2 Community electricity supply,

4.3 Improvement to nutritional status of children, and

4.4 Secondary school (at least first two years).

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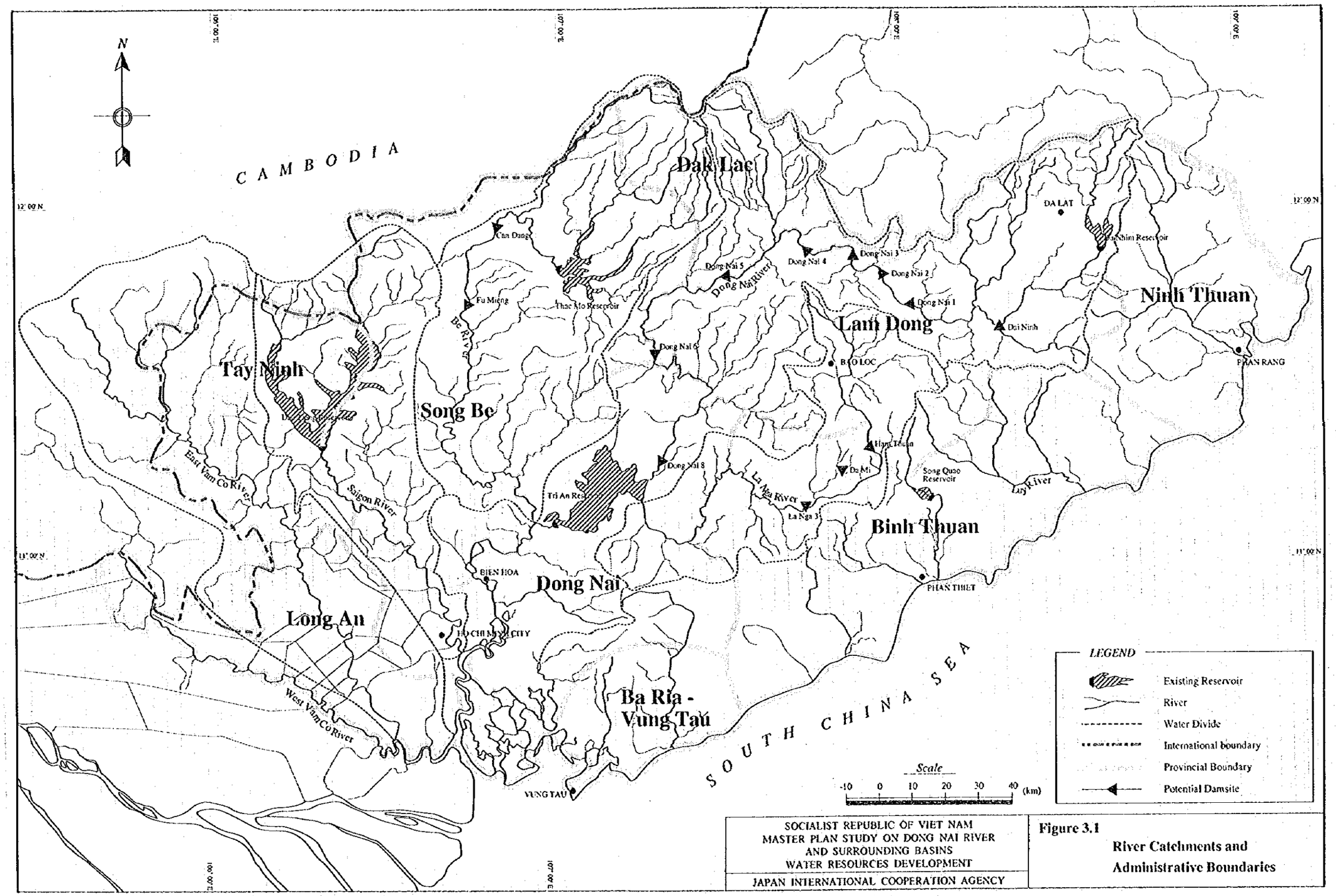
FIGURES



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AND SURROUNDING BASINS
WATER RESOURCES DEVELOPMENT

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Figure 3.1

River Catchments and Administrative Boundaries

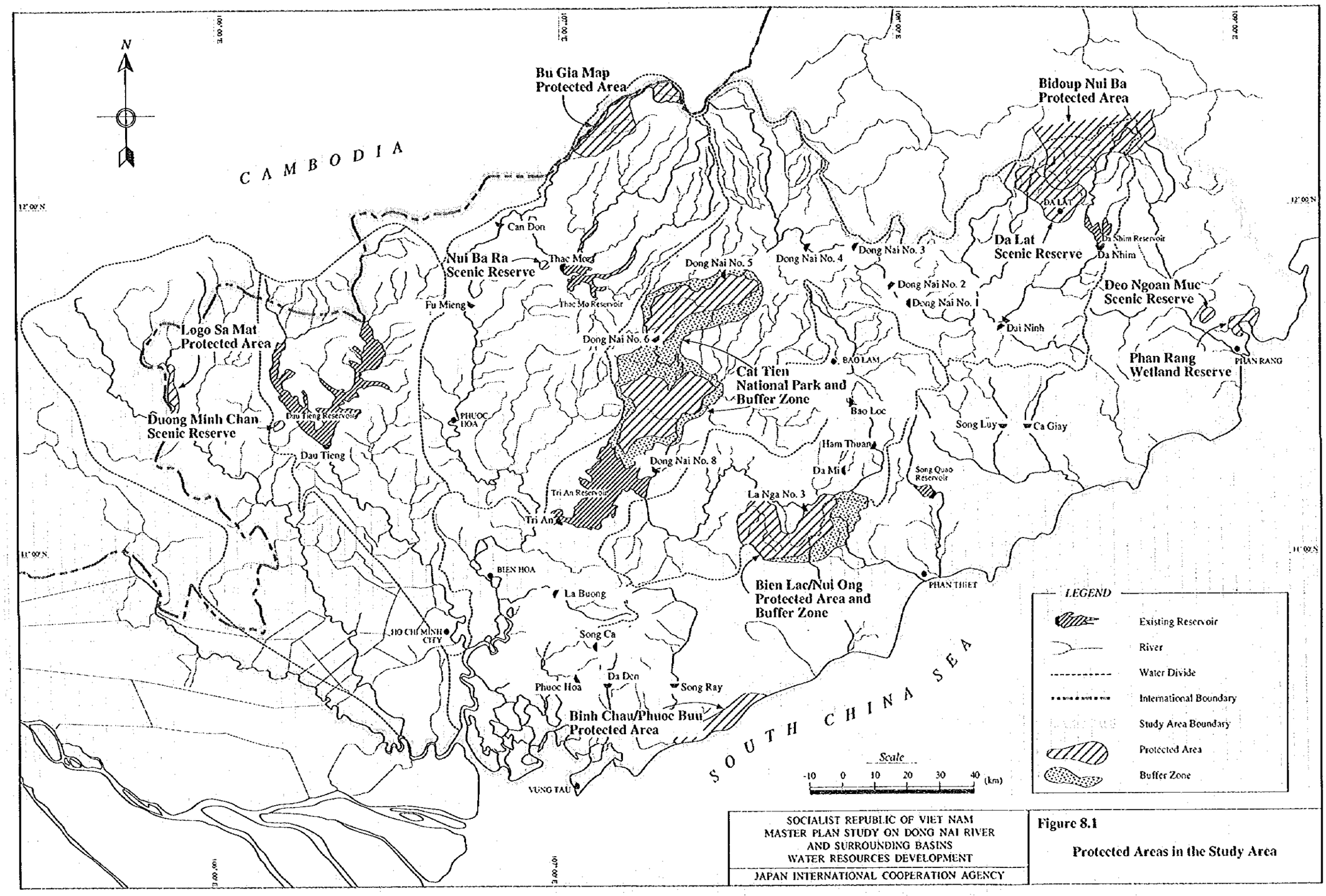

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Figure 8.1

Protected Areas in the Study Area

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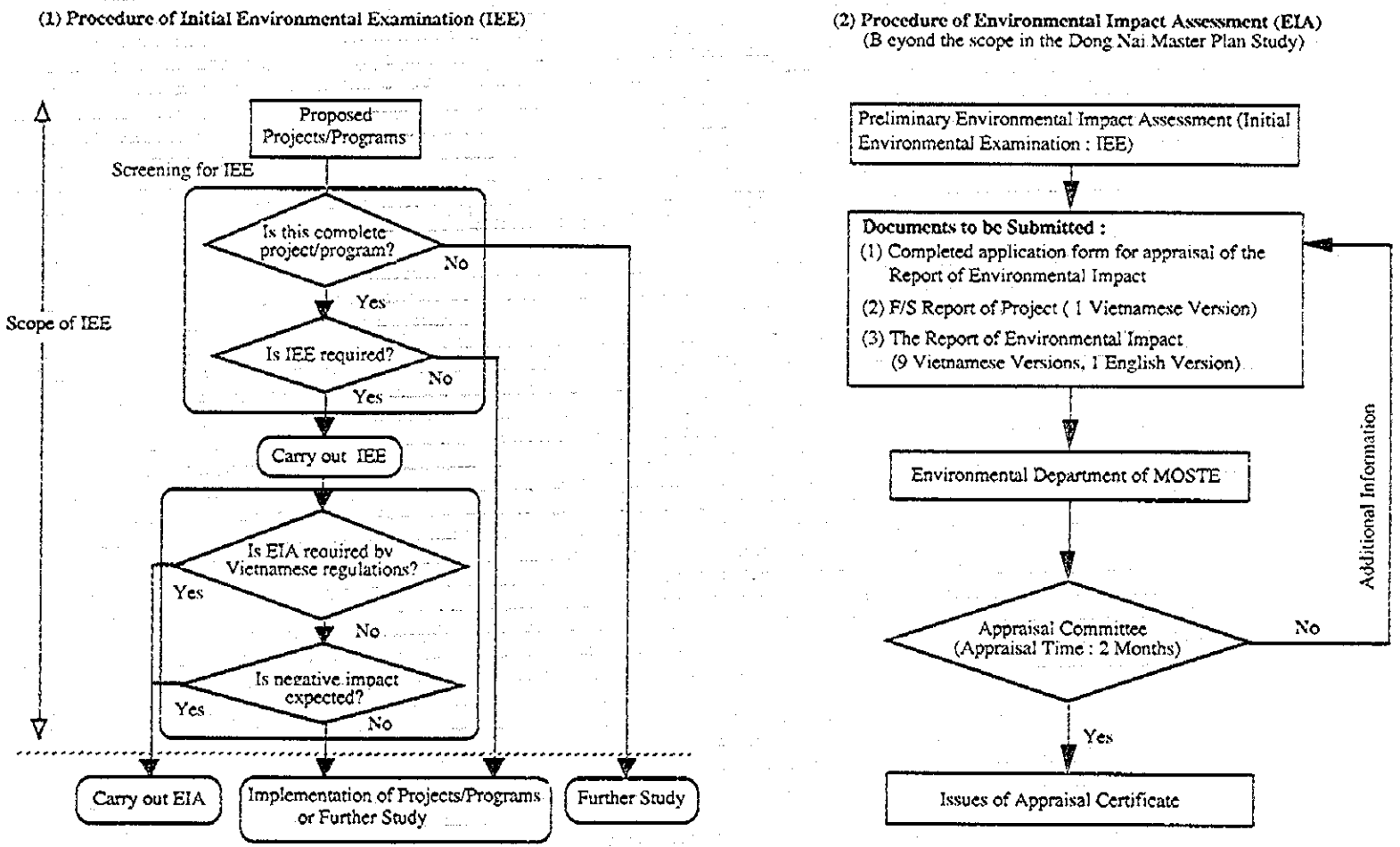
Figure 9.1
IEE & EIA Procedures in Viet Nam



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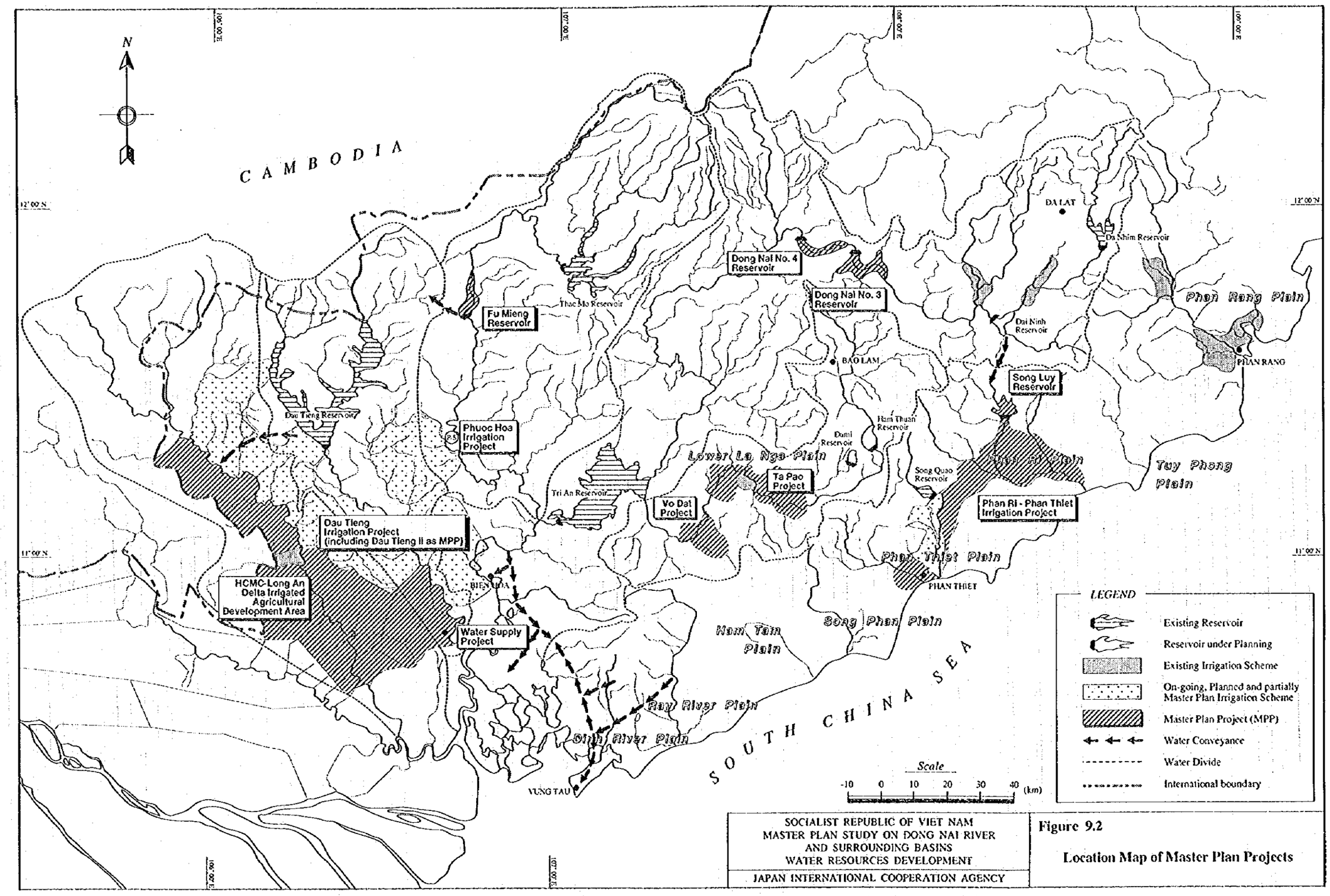

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Figure 9.2

Location Map of Master Plan Projects

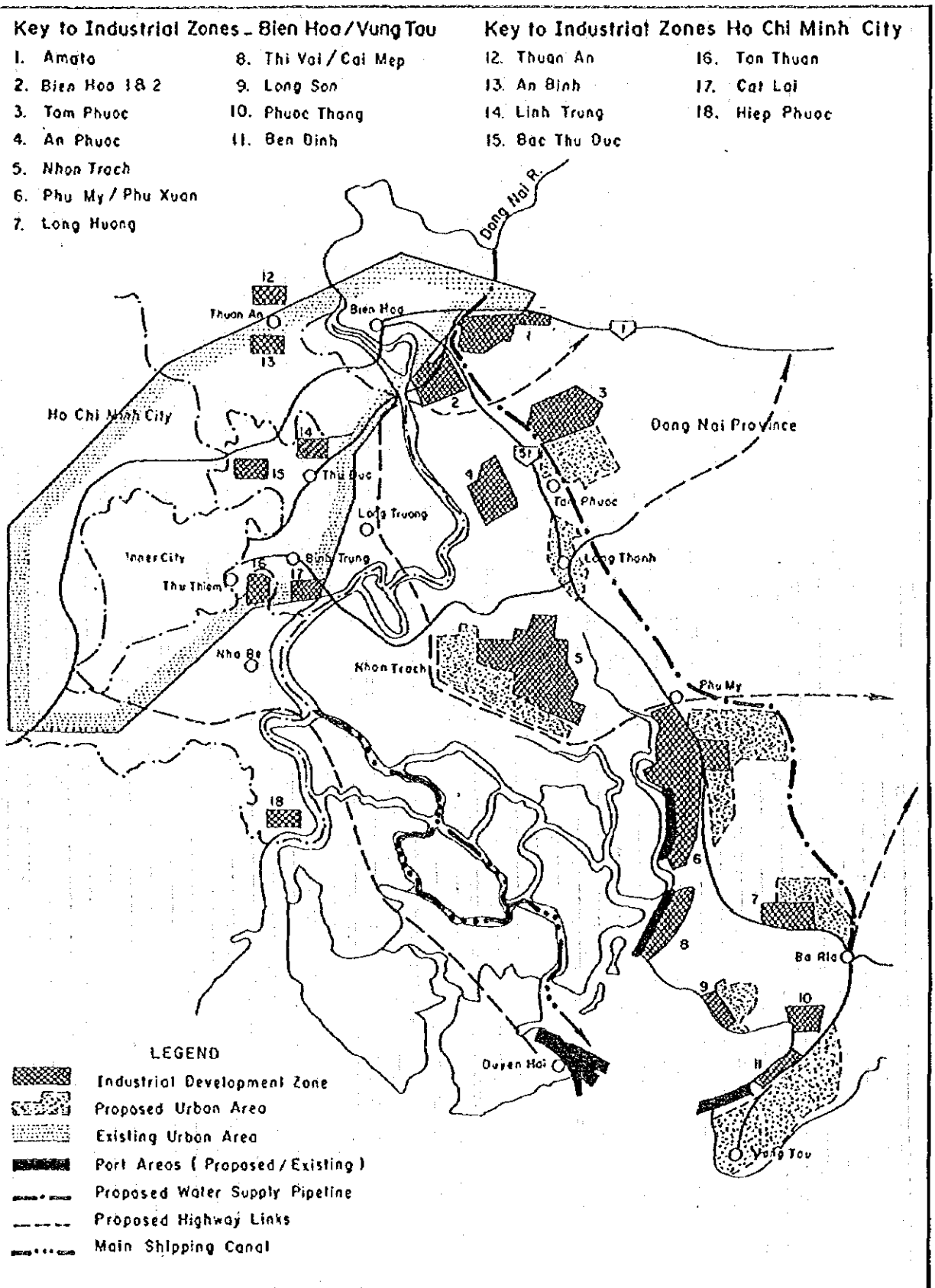

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Figure 9.3

Existing and Proposed Industrial Development Zones and Urban Areas Developed in the Dong Nai Delta