

タイ王国

トラット県の環境保全と農業総合開発計画

基礎調査報告書

平成 2 年 3 月

(社) 海外農業開発コンサルタント協会

序 文

太陽コンサルタンツ株式会社は、社団法人海外農業開発コンサルタンツ協会の補助金を受け、平成2年3月11日から平成2年3月21日までの11日間にわたって、タイ国の環境保全に関する農業開発の基礎調査を行いました。

タイ国においては、最近、各種開発による環境破壊が進み、農地の疲弊、森林の減少、河川・海岸の環境破壊問題が起き、これらの対策が緊急の課題となっております。

タイ国東方のトラット県の内陸部では材木の伐採及びルビーの採掘が行われており、その跡地の放棄による土地の荒廃とルビー採掘現場から流出する多量の土砂が周辺環境に大きな影響を与えております。特に流出する土砂は海にまで達し、河口に堆積し、マングローブが枯死したり、魚介類が採れなくなるなど生態環境に被害が起きております。

このような状況下で農業・組合省の土地開拓局（DL D）とトラット県庁は、これらの地域に対して自然破壊の拡大防止と、農業開発を図ろうとしている。このため、この地域を計画対象地としてマスタープランを実施し、その中で優先度の高い地区及び内容についてパイロットファームのF/Sを実施しようとしており、その計画を日本政府による技術及び経済援助により実現したいとの意向を持っております。

本調査の実施に当たり、農業・組合省土地開拓局（DL D）の山本専門家及びJICAタイ事務所の山下氏に多大の支援を賜りました事をここに深く謝意を表すとともに、今後、この計画が日本政府の技術協力、経済協力により推進されることを期待致します。

平成2年3月

太陽コンサルタンツ株式会社

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1. 事業の経緯、背景

タイ国政府は、第6次国家経済社会開発計画（1987～1991）の中で天然資源・環境開発及び農村開発を主要な政策目標とし、この政策に法って各地域で数多くの開発プロジェクトを実施している。

このような政府の努力の結果、農村地域の多くの問題を解決してきたが、農村の貧困、環境破壊問題など解決されなければならない問題点が未だに残っている。

トラット県は、タイ国の中でも降雨に恵まれた地域で、材木業、漁業の他に各種果樹及びゴムなどの工芸作物が栽培されている比較的農業の盛んな地域である。

しかし、県の内陸部に入ると材木の伐採と宝石（ルビー：特にSiam Ruby と呼ばれる）の採掘が行われており、その跡地の不法放棄と採掘現場から流出する多量の土砂が周辺の環境に大きな影響を与えている。特に流出する土砂は海にまで達して、河口周辺に堆積し、マングローブが枯死したり、その影響で魚介類が採れなくなるなど大きな影響が出てきている。

このような状況を改善するため、ルビー採掘跡地を含めた地域について農業開発を行い、地域住民の定着と所得を向上しつつ材木の不法伐採の防止、採算性の低いルビー採掘から農業への転換等を図り、その結果として環境の保全を行おうとするものである。

2. 計画地区の概要

2.1 自然状況

(1) 位置

プロジェクト地区はタイ国の東部、トラット県に位置する海岸部から内陸部に位置し、内陸部はカンボジア国境に接する。

(2) 地形

プロジェクト地区は標高0 mから 200mの間であり、凡そ以下に分けられる。

① 低地部

標高30m以下の地域で稲作に適する。

面積は約 8,793ライ (約1,435 ha)

② 宝石採掘跡地

ルビー採掘跡地で、掘られたまま放置された凹地あるいは裸地として残されている地域。

面積は約25,270ライ (約4,043 ha)

③ 中位部 (緩傾斜地)

地区の地形勾配は 3~16%を示し、最大の面積を有する地域である。農業としては各種果樹とゴムなどの工芸作物が適する。

面積は約61,756ライ (約9,880 ha)

④ 丘陵地域

地区の地形勾配は16~35%を示し、土壌保全などの処置を行うことにより農業が可能となる地域。

面積は約 1,174ライ (約 188 ha)

⑤ 山岳地域

地形勾配は35%以上を示す急峻な地域で、森林として残す開発不可地域。

面積は約 6,485ライ (約1,038 ha)

(3) 気候

この地域は海に面しているため、大きく次の2つの季節がある。

- ・南西モンスーン季節：雨が多い、6月から9月の間。
- ・北東モンスーン季節：比較的雨が少ない、12月から3月の間。

① 降雨

トラット県はタイ国の中でも雨の多い地域である。

トラット県の降雨量（30年間平均）

単位:mm

月	1	2	3	4	5	6	7	8	9	10	11	12	年間
雨量	37.1	36.4	91.9	163.9	324.4	535.8	611	568.2	585.5	327.8	91.6	14.3	3,387

② 気温

年平均気温は27.3℃、最低は1月の26.0℃、最高は4月の28.3℃である。

③ 蒸発

年間約500mm（1951～1965の15年間平均）

④ 湿度

相対湿度約80%（1937～1965の29年間平均）

2.2 社会状況

地区内には約 7,000家族が在るが、その内約65%がルビー採掘に係わっており、残りの35%が農業を営んでいる。

しかし、近年はルビー採掘の採算性が低くなっており、所得も農業所得より低い状況である。トラット県の平均農業収入は約 19,000 バツ/年であるが、この地域の収入平均は約 10,000 バツ/年で約半分である。

* 1990年3月時点での外貨交換レート

1.00US\$=153.30¥ 1.00US\$=25.11BT 1.00BT=6.105¥

2.3 農 業

トラット県は、降雨に恵まれた地域で各種果樹及びゴムなどの工芸作物が栽培されている農業の盛んな地域である。

しかし、計画地区内には一部にゴム、果樹、キャッサバ、陸稲などが栽培されているが、農業の一貫した計画が無いため農業の遅れた地域となっている。

計画地の農業開発を行う事によって、採掘跡地の有効利用と農業への雇用促進が緊急課題となっている。

3. 計画概要

3.1 目的

この計画の目的は、主に以下の2つとなる。

(1) 土地と水資源のための環境保全

- ・農業未利用地の農業開発（材木伐採跡地も含む）
- ・ルビー採掘跡地の農業利用
- ・かんがい施設を整備することにより、ルビー採掘現場から流出する土砂の流出防止
- ・森林の復活
- ・漁業の復活

(2) 農業総合開発による生活の向上と雇用の拡大

- ・換金作物の導入、農村工業の導入を行い農業収入の増大を図る。
- ・農村インフラの整備、改善により雇用機会を拡大する。

3.2 計画コンポーネント

上記の目的を達成するための、計画コンポーネントは以下の通りである。

(1) 農地造成

農業の未利用地を農地として造成する他、ルビー採掘跡地を農地として利用する為に造成を行う。

(2) 水利施設の建設

かんがい用の小規模ダムを建設する事によって、ルビー採掘地から出る土砂を溜める効果も持たせる。これにより、河口のマングローブを保護する。

(3) 植 林

地区の丘陵部あるいは山岳部に果樹、工芸樹木、一般樹木を植林しする。これは裸地を緑化するとともに森林を増やす。

(4) 農村工業、畜産

農産物の加工、処理及び畜産物の加工、処理を行う事によって付加価値の高いものを生産し、所得の向上、雇用の拡大及び地域の活性化を図る。

(5) インフラストラクチャーの整備

道路、学校、病院及び共用施設を建設・整備することによって生活の環境改善を行う。

(6) 環境保全センターの建設

環境保全センターを建設し、東部タイ全体の環境保全の為の調査・研究・計画作りなどを行う。

(7) 観光開発

タラット県は海、島、山、宝石などがあり、観光地として有望な地域でもあるので、観光開発も併せて行う。

3.3 計画に必要な調査の内容

この地域の環境保全と農業総合開発の為の調査は次の2つのPhaseに分けて実施される。

Phase I : タラット県全域の雨期調査

Phase II : 計画地区の乾期調査

(1) Phase I 調査（予備調査）

① 資料の収集、解析

- a. 自然状況
- b. 社会経済状況
- c. 農業
- d. かんがい排水

② 現地調査

- a. 現地概査
- b. 地形、地質、土壌の調査・分析
- c. 計画地区のかんがい諸元
- d. 農業経営

- ③ 資料の解析
 - a. 水文・気象
 - b. 地質、土壌
 - c. その他
- ④ プレマスタープランの作成
 - a. かんがいシステム
 - b. 土地利用計画
 - c. 農村工業計画
 - d. インフラ計画
 - e. 観光開発計画

(2) Phase II 調査（マスタープランの作成）

- ① 補足資料の収集、解析
- ② 現地調査
 - a. 地形測量
 - b. かんがい排水
 - c. 農業
 - d. 農村工業
 - e. 農業経済
- ③ 資料の解析
- ④ マスタープラン計画
 - a. 土地利用計画
 - b. かんがいシステムの計画
 - c. 作付計画
 - d. マーケティング計画
 - e. インフラ、観光開発計画
- ⑤ 事業実施計画
- ⑥ 事業便益と事業費
- (7) 事業評価
- (8) その他

4. 総合所見

本計画は、国家経済社会開発計画においても主要な政策課題である資源・環境開発及び農村開発という面から計画されたプロジェクトであり、タイ国において高い優先度が与えられている。

また、この計画が実施されると農業は安定し、地域住民の雇用が増大するため、これらの地域に与える経済的効果及び社会的効果は計り知れない程大きいと思われる。

土地開拓局（DL D）及びトラット県は、この地域の計画を早期に実施したいと考えており、高い優先度を持って日本政府の協力を期待しております。

環境問題は、世界的にも高い優先度が与えられている今日、特に東部タイは森林保護、土壌保全など脚光を浴びております。このような中で本計画は、誠にタイムリーな案件であると考えられます。

今後、この計画が日本政府の技術協力、資金協力により実施されることを期待致します。

5. 添付資料

(1) 調査日程

日 程 表

日数	年月日、曜日		出発地	到着地	宿泊地	行動内容、その他
1	H. 2. 3. 11	日	成 田	Bangkok	BKK	移動日
2	3. 12	月			BKK	DLD 本部打合せ
3	3. 13	火			PATAYA	移動 (BKK to CHON BURI) DLD Region 2打合せ
4	3. 14	水			KANTABURI	現地調査 (TRAT)
5	3. 15	木			PATAYA	現地調査 (TRAT)
6	3. 16	金			BKK	DLD Region 2打合せ 移動 (CHON BURI to BKK)
7	3. 17	土			BKK	報告書作成、資料収集
8	3. 18	日			BKK	報告書作成
9	3. 19	月			BKK	DLD 本部打合せ
10	3. 20	火			BKK	JICA事務所報告
11	3. 21	水	BKK	成 田		移動日

(2) 調査団員

①総括： 椎名 乾治

昭和3年1月22日生（62才）

太陽コンサルタンツ株式会社 代表取締役社長

②農業経済： 安部 望五

昭和20年6月12日生（44才）

太陽コンサルタンツ株式会社 海外事業本部 開発部部長

③灌漑排水： 住友 俊夫

昭和25年2月7日生（40才）

太陽コンサルタンツ株式会社 海外事業本部 企画営業部部長

(3) 関係機関関係者

- | | | |
|---------------|-------------------------------|---|
| ①DLD本部 | Mr. BOONYARUK SUEBSIRI | Deputy Director General |
| | Mr. PRAIWAN RESAN | Director of Planning Division |
| | Mr. MANU OMAKUPT | Director of Land Use Planning
Division |
| | Miss. PHACHONGCHIT BOONYARACH | Policy and Program Analyst |
| | Mrs. KULWADEE INNUPAT | Policy and Program Analyst |
| | Mrs. WARAPORN BOONSORN | Foreign Relations Officer |
| | 山本 明 | コンボラン 専門家 |
| ②DLD Region 2 | Mr. PADEGE KANCHANAKOOL | Director of DLD Region 2 |
| | Dr. PORNCHAI SUTHATORN | Chief of Technical Section 1, |
| | Mr. UDON PULSAWATH | Chief of Technical Section 2, |
| | Mr. SU TAT SITTISOMWONG | Chief of DLD Kantaburi Station |
| | Mr. SANAN POUNGPAY | Chief of DLD (Trat Station) |
| | 徳岡 昭治 | 青年海外協力隊 |
| ③トラット県長 | Mr. PRAPATPONG BARPENSILP | Dputy Governor |
| ④JICA 事務所 | 山下 | JICAタイ事務所 |
| ⑤ADCA賛助会員 | 原 信義 | 丸紅(株)タイ事務所 |

(4) T O R & F i e l d R e p o r t

次ページ以降に記す。

THE KINGDOM OF THAILAND
MINISTRY OF AGRICULTURE AND COOPERATIVES

TERMS OF REFERENCE
FOR
THE MASTER PLAN OF
ENVIRONMENTAL CONSERVATION
AND INTEGRATED AGRICULTURAL DEVELOPMENT
FOR TAMBOL NONG BORN
IN
TRAT PROVINCE

APRIL 1990

DEPARTMENT OF LAND DEVELOPMENT

AGRICULTURAL DEVELOPMENT CONSULTANTS ASSOCIATION, (ADCA)

*Address: 5-34-4, SHINBASHI,
MINATO-KU, TOKYO, JAPAN*

*Tel: (03) 438-2590
Cable Address: ADCA DAIMON TOKYO*

Date: 16 April 1990

Mr. Sitilarp VASUVAT
Director General
Department of Land Development
Ministry of Agriculture and Cooperatives
Bankhen, Bangkok 10900 Thailand

Re: Submission of T.O.R.(Terms of Reference)
for the Master Plan of Environmental
Conservation and Integrated Agricultural
Development for Tambol Nong Born in Trat Province.

Dear Sir,

We are pleased to submit herewith to you Five (5) copies of the T.O.R. mentioned above for your consideration.

This T.O.R. is made upon the survey of our ADCA Project Finding Team based on assistances and discussions rendered to our team by DLD (Bangkok Head Office and Region 2) as well as Trat Provincial Office.

We hope that this T.O.R. will be useful to your Department in future concerned planning. Thanking you and your dynamic staff.

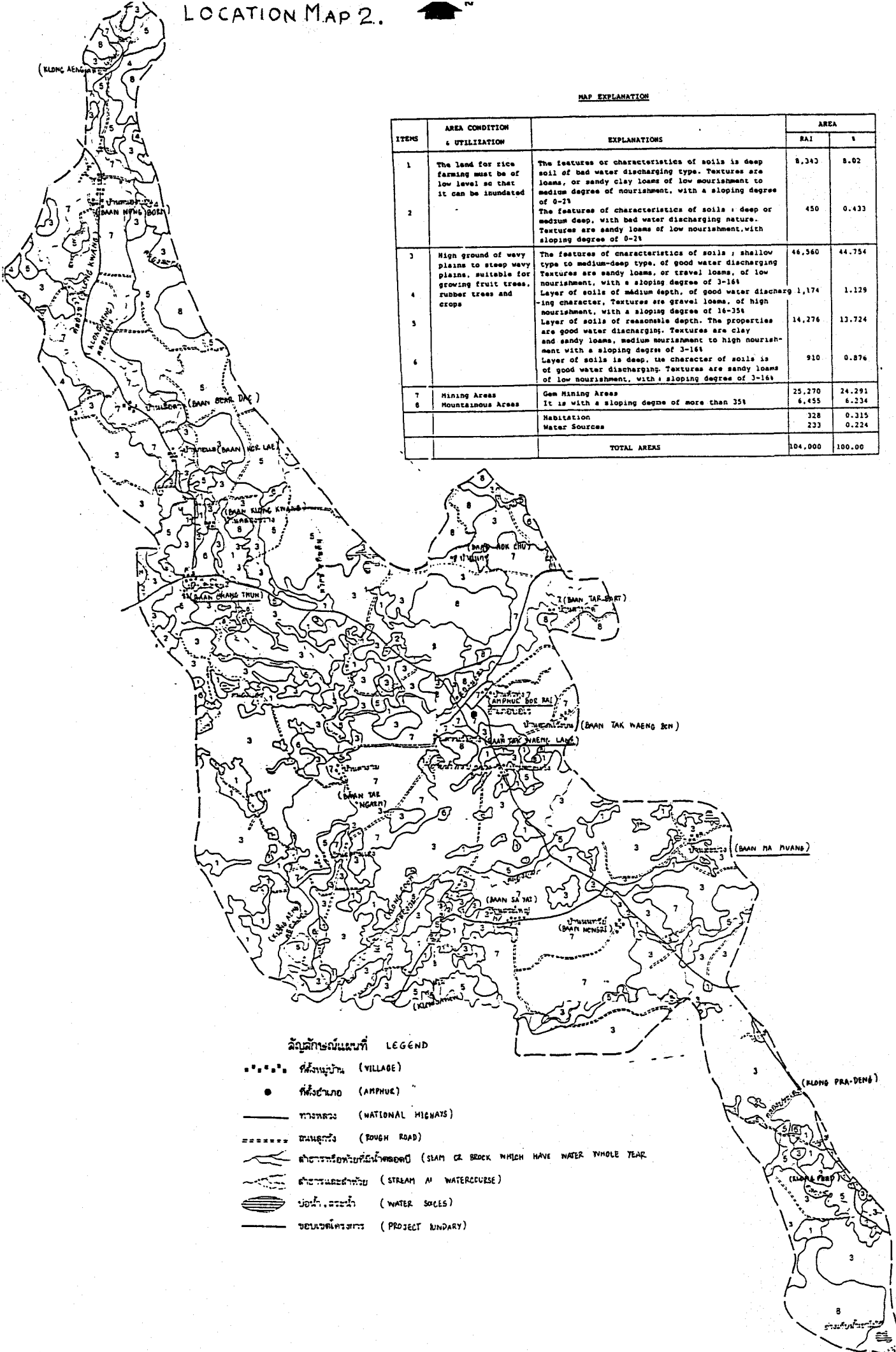
Yours faithfully,

Bogo ABE
Toshio SUMITOMO
ADCA Project Finding Team

LOCATION MAP 2.

MAP EXPLANATION

ITEMS	AREA CONDITION & UTILIZATION	EXPLANATIONS	AREA	
			RAI	%
1	The land for rice farming must be of low level so that it can be inundated	The features or characteristics of soils is deep soil of bad water discharging type. Textures are loams, or sandy clay loams of low nourishment to medium degree of nourishment, with a sloping degree of 0-2%	8,343	8.02
2		The features of characteristics of soils : deep or medium deep, with bad water discharging nature. Textures are sandy loams of low nourishment, with sloping degree of 0-2%	450	0.433
3	High ground of wavy plains to steep wavy plains, suitable for growing fruit trees, rubber trees and crops	The features of characteristics of soils : shallow type to medium-deep type, of good water discharging. Textures are sandy loams, or gravel loams, of low nourishment, with a sloping degree of 3-16%	46,560	44.754
4		Layer of soils of medium depth, of good water discharging character. Textures are gravel loams, of high nourishment, with a sloping degree of 16-35%	1,174	1.129
5		Layer of soils of reasonable depth. The properties are good water discharging. Textures are clay and sandy loams, medium nourishment to high nourishment with a sloping degree of 3-16%	14,276	13.724
6		Layer of soils is deep, the character of soils is of good water discharging. Textures are sandy loams of low nourishment, with a sloping degree of 3-16%	910	0.876
7	Mining Areas	Gem Mining Areas	25,270	24.291
8	Mountainous Areas	It is with a sloping degree of more than 35%	6,455	6.234
		Habitatation	328	0.315
		Water Sources	233	0.224
TOTAL AREAS			104,000	100.00



สัญลักษณ์แผนที่ LEGEND

- หมู่บ้าน (VILLAGE)
- อำเภอ (AMPHUR)
- ทางหลวง (NATIONAL HIGHWAYS)
- ===== ทางลูกรัง (ROUGH ROAD)
- ~~~~~ คลองหรือลำน้ำที่น้ำไหลตลอดปี (SLAM OR BECK WHICH HAVE WATER WHOLE YEAR)
- ~~~~~ ลำน้ำหรือลำน้ำ (STREAM OR WATERCOURSE)
- ||||| บ่อน้ำ (WATER SOCES)
- เขตโครงการ (PROJECT BINARY)

(*)

MAP EXPLANATION

ITEMS	EXPLANATION	AREAS	
		RAI	%
1	Low Plains where there is flood in rainy season, with a sloping degree of between 0-2%	8,793	8.453
2	Land after the exploitation of gem	25,270	24.291
3	Land of low curving level and steep curving level, with sloping degree of 3-16%	61,746	59.354
4	Hilly Ground : with a sloping degree of 16-35%	11,174	1.129
5	Mountainous region with sloping degree of more than 35%	6,485	6.234
	Water Sources and Habitation	562	0.539
	Total	104,000	100.00

SITE-PICTURES



1. Access-Road
to the Project-site



2. Project site:
Abandoned land after
mining exploitation



3. Project-site:
Mining exploitation
in operation and
washing procedure



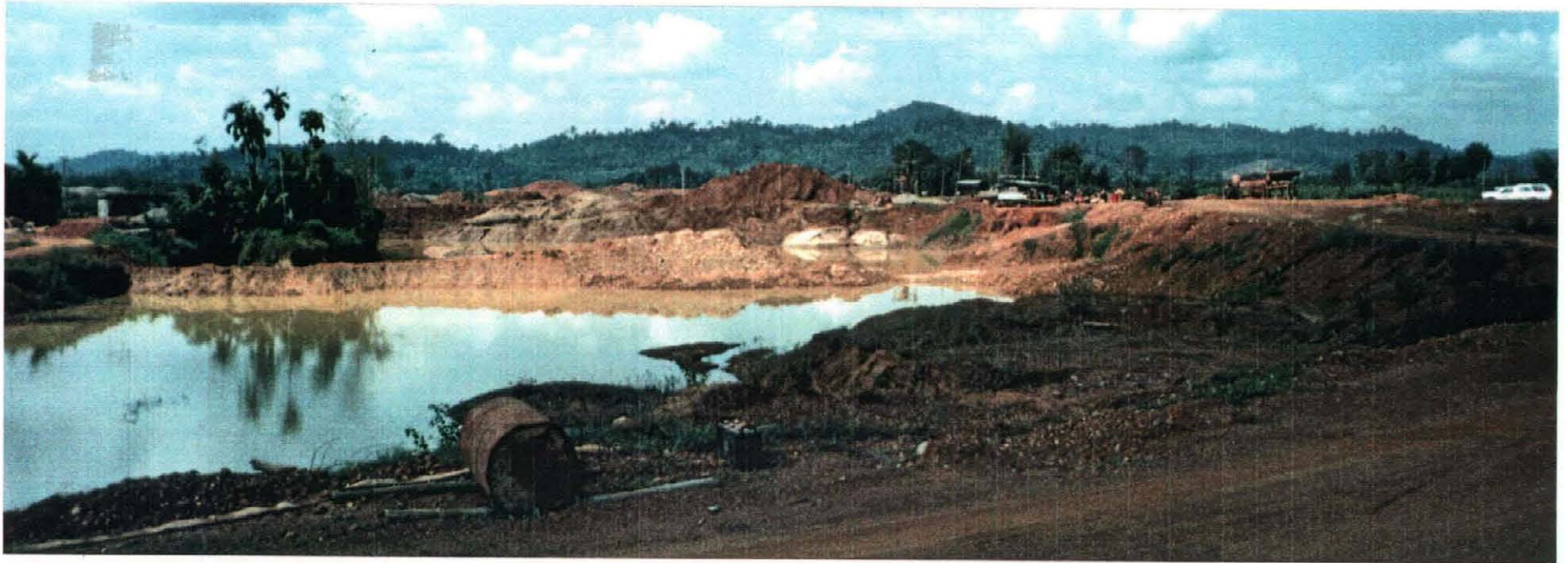
4. Devastated situation of mangroves at coastal areas



5. Grave situation of sedimentation at the outlet of Trat River



6. Meeting between Deputy-Governor of Trat Province and DLD Region 2 officials for proceeding the Project



7. A panoramic view at the Project-site

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I. PROJECT-BACKGROUND

1.1 General

As a result of various exploitations of natural resources for economic reasons, the Kingdom of Thailand has been largely affected by deforestation, devastation of lands and water resources, and subsequently, ecological changes in corresponding regions, causing a present situation of grave damages to environmental conditions in various parts of the country.

Trat Province, situated in the East bordering Cambodia, has been so far suffered from a situation of economic depression. Major economic activities, therefore, have been observed in the primary sector such as lumbing, fishery, agriculture and, particularly, mining exploitation.

Since the early sixties, the region is well known of its mining exploitation, especially " Siam Ruby ", resulted in innumerable mining locations here and there in this remote area, causing a serious devastation of lands after digging for this purpose. Consequently, damages to water resources due to sedimentation come from this operation, have been considered as a cause to mangrove destruction and marine devastation in these coastal areas.

This hazardous situation is considered increasingly in a high pace in the East, from Pattaya, through Rayong to Trat, enquiring urgently proper measures for preventing further damages to this part of the country.

The task of environmental conservation, therefore, is now considered as an urgent matter to be carried out at the utmost priority in order to reform green valleys, forests, mangroves and clean water not only for purposes of development in agricultural and marine but also to maintain healthy environmental conditions for the life of a nation.

On the basis of this concept, Trat Province with the present

situation of environmental devastation should be considered at first priority in the framework of a conservation oriented project for these purposes.

And, with the formulation of a Master-Plan for this kind of project which can be properly applied for other similar regions affected by various environmental damages in the whole country, the nature of ecology in the Kingdom of Thailand, therefore, would be largely improved.

1. 2 Project-Outlines

In the scope of regional development, Trat Provincial Office and the Central Department of NESDB had assigned DLD Region 2 to make a survey on the development plan for Tambol Nong Born in 1988 where most lands are uplands of tropical forests adjacent to the mountainous region of Khao Sam Ngam, Khao Kapum Bai Ka Ngeng, Khao Talat and Khao Tap Kadai bordering the war-raged country of Cambodia

Two aspects have been observed in the background of this development plan. First, as a resolution of the Government, approximately half of the total area of Tambol Nong Born has been planned as reserved pension-areas for Navy and the Cabinet officials after their retirement. Secondly, Amphur Bor Rai has been known for the existence of precious stones, especially "Siam Ruby". Mining exploitation for this gem is a main revenue for Trat Province, therefore, land excavation for this purpose has been done in large scale in Tambol Nong Born, devastating land and water resources, affecting the lower parts with the destruction of mangroves in coastal areas, and posing a threat to ecological conditions in the region.

A report on the development plan of Tambol Nong Born in Trat Province was made in 1988 and submitted to Provincial Office of Trat Province and Central Development Division of NESDB, notifying the classification of lands and corresponding development plans based on 3 aspects, agriculture cum forestry, industry and tourism.

Due to reasons of insufficient finances and the enduring conflict-situation in Cambodia, further actions on this development-plan have not been taken by the Provincial Office of Trat Province as well as NESDB, while the devastation of land and water resources has been gradually expanded, causing further damages to the total environmental conditions of the region.

With the restoration of peace in Cambodia, Trat Province should be properly developed for environmental conservation and integrated agricultural aspects for the benefits of its local inhabitants which Tambol Nong Born would be considered a pilot project not only for purpose of maintaining the nature of ecology but also making this part of the country developed in land and water resources for prevailing the national sovereignty.

1.3 Project-Area

(1) Socio-Economy:

The area of Tambol Nong Born in Amphur Bor Rai of Trat Province covers about 104,000 rai. Most of its lands are national reserved forests, such as "Kao Sming" Forest, "Klong Yai" Forest, and "Kao Fai Mai" Forest. Some parts in the upper region are being projected by the Navy for allocation to retired naval officials, and the middle part of the region in Tambol Chang Toon, Tambol Bor Ploy and the lower part of the region have been separated from areas reserved as national forests by a resolution of Government.

Presently, most lands have been deforested, except some hills or mountains. Besides, people from different parts of the country have come to the area for gem finding.

Excavation for mining exploitation has affected the environment due to the devastation of areas abandoned after exploitation without any proper reclamation.

From mining exploitation, the sediment of soils flows into waterways, canals, and then into sea, has reportedly caused environmental damages to the coastal areas with the destruction of mangroves and marine products. The brown-coloured water in the region cannot be used for agricultural purpose.

Of about 7,000 families in Amphur Bor Rai, approx. 65 percents of the population are engaged in mining works, while 35 percents are living on farming.

Regarding mining exploitation, this has been started with a mobilization of large population since the middle of 1960's with mostly manual methods using simple tools for digging, washing and sieving.

But later, in late 1960's, modern machineries have been gradually introduced for using in excavation in large scale. Some places were done to a depth of nearly 100 meters.

Recently, however, mining exploitation has been gradually declined due to its high cost in exploitation but low revenue due to a low collection of precious stones. Many mines, therefore, closed down. This resulted in a declination in economic atmosphere.

Regarding farming, approx. 2,500 families in Amphur Bor Rai, or 35 percents of its population, have been living on farming, cultivation of rubber trees, fruit-trees and some paddy. Their income has been reportedly below 10,000 Baht/year which is lower than the average income of agricultural family in the province (approx. 19,000 Baht/year)

(2) Geographical Features:

The land in Tambol Nong Born of Amphur Bor Rai of Trat Province is situated nearly close to the frontier of Thailand-Cambodia in the area of the range "Mount Bantat"

which covers national reserved forests namely, Kao Sming Forest, Klong Yai Forest and Kao Fai Mai Forest. The area is of long and tapering shape ; paralleling with the range in slanting direction through the area in Amphur Bor Rai, the direction of North-West - South-East covering an area in Tambol Nong Born, Tambol Chang Toon, Tambol Bor Ploy and Tambol Dan Chumpol, a total area of about 166.4 sq. kilometres(104,000 rai), with boundaries as follows:

In the North: Bordering "Klong Pook" Mount, about 2 kms. from Huay Sator (Sator Brook), the latitude is 12° 42' 50" N.

In the South: Bordering Baan Den Chumpol and "Manao" Mount. The latitude is 12° 26' 21" N.

In the West: Bordering "Klong Pook" Mount and "Ma Pring" Mount about 10 kilometres from the frontier of Cambodia. The longitude is 102° 26' 34" E.

In the East: Bordering "Klong Goom" Mount, Ed Mount, Baan Ma Muang. The longitude is 102 ° 37' 42" E.

The feature of most parts under the project-area is considered wavy with some small hills scattering here and there, alternating with narrow plains, which can be classified as follows:

- 1) Low Plains where there is flood in rainy season, with a sloping degree of between 0 - 2 %, cover an area of about 8,793 rai (8.453%). They are narrow plains between hills, high above sea-level of medium range, approx. 15 - 30 metres. It is recommended that such plains be used for growing rice with developed water reservoirs. In case of rice cultivation, a proper lay-out of rice fields must be adopted to ensure the reservation of water all through the

farming season.

2) Land after mining exploitation :

This type of land is of uneven level containing heaps of soils and stones with pits and holes or sedimentary grounds. Such type of land covers an area of about 25,270 rai (24,291).

To improve such type of land will need a confirmation from Provincial Office.

3) Land of low curving level and steep curving level:

This land with a sloping degree of 3 - 16% covers the large part of the project-area. Its total area is about 61,756 rai (59.354%). Its major part is abandoned and uncleared.

There are scattering cultivation spots of crops, rubber trees and fruit trees. The area of such land is mainly subjected to the agricultural development plan. In case for growing crops, there must be a proper system for conservation of soils and water. Plants to nourish the earth must be grown also. In case for growing fruit-trees and rubber trees, the trees must be planted in line crossing the sloping line of the land and covering plants must be grown; or to grow crops in alternative line with rubber trees.

Fruit-trees, during the first three years, As for the improvement of soils and the rate of application of chemical fertilizer, they will all depend on the properties of soils. (Please refer to the data about Soils).

4) Hilly Ground: with a sloping degree of 16 -35%.

Such type of land covers an area of approx. 1,174 rai (1.129%) of such high degree of slope. Consequently, it necessary to have a perfect system of conservation of soils and water.

5) Mountainous region with sloping degree of more than 35%.

Such type of land covers an area of approx. 6,485 rai (6.234%).

This type of land should be conserved as areas for permanent forests.

(3) Climate:

1) Climate: This coastal region locates on the open-sea. Consequently, it has been fully influenced by south-western monsoon. Therefore, it is much rainy during the period of June - September; and during the period of north-eastern monsoon, December - March, less rain is observed.

2) Rain: The average rain precipitation in this region is approximately 3,400 millimetres/year. During the period of November - March, the rain is less. In December, the precipitation is at the lowest, average of approx. 8 mm/day. The rainy season of this region starts from April till October, the volume of precipitation per month is more than 300 millimetres and this will increase continuously, especially in August, where the precipitation will be as high as approx. 700 millimetres. After this period rain will be gradually decreased until October.

There are regular rain falls every month, but from December to February, minimum rain falls are observed. Consequently, this would possibly be considered as references in connection with plantation of fruit-trees.

Annual	J	F	M	A	M	J	J	A	S	O	N	D
3,387	37.1	36.4	91.9	163.9	324.4	535.8	611	568.2	585.5	327.8	91.6	14.3

(Average of 30 years)

3) Temperature:

In this region, the yearly average temperature is 27.3°C. while the minimum monthly average temperature is in

January at 26.0 °C., while the maximum average temperature in April is at 28.3°C .

There is not much variance in temperature between days and between months. During the rainy period, the temperature shows a rather low value.

4) Evaporation:

Observation in 15 years (1951-65) by the Meteorological Department shows approx. 500 mm.

5) Humidity:

Regarding humidity, data of 29 years (1937-65) by the Meteorological Department show that a relative humidity of 80 percent and more has been observed.

(4) Land:

a. Gem Mining:

The area of gem mining is about 25,270 rai. According to the survey, gem mining activities are carried out in three big areas, namely,

- 1) Baan Nong Born, Baan Suar Dao and Baan Kor Lae.
- 2) Tambol Bor Ploy, from Baan Pa Ar, Baan Tar Bart, Baan Hua Tung, Baan Tak Waeng Bon, Baan Tak Waeng Lang, Baan Tar Ngarm and Baan Klong Aeng.
- 3) Baan Nonsri and Baan Sa Yai.

b. Cultivation:

Crop growing, rice farming, rubber-tree plantation and fruit-tree plantation are presently performed on a total area of about 41,200 rai.

Based on the data of land exploitations, it can be summarized as follows: -

- 1) Rice Farming: Only 3,745 rai (about 42.59%) are cultivated out of the whole area suitable for rice farming (about 8,793 rai).
- 2) Crop-Growing: Plantations of rubber-trees and fruit-trees, and others, and crops are grown in about 37,455 rai (about 59.51%) of

the whole area, suitable for crop growing of about 62,930 rai.

(5) Soils:

1) Features of Soils:

According to the survey, soil features in the project-area are as follows:

a. The major part of soils in the upper part of the project area, from Baan Chang Toon and upper, up to Baan Nong Born, are deep, of brown and/or red brown colour, or red colour, in the form of either heavy loams or clay with good discharge of water and high degree of holding water.

They are of medium up to high degree of nourishments, suitable for fruit tree and rubber tree plantations.

As for the abandoned mining, these lands, can be used for plantations of fruit-trees and rubber-trees, but the levelling and land reclamation are needed.

b. The major part of soils in the lower areas under the project, from the lower part of Bon Rai District Office site and Baan Chang Toon, in the areas of Baan Nong Aeng, Baan Tak Waeng Lang, Baan Tar Ngarm, Baan Klong Aeng, Baan Tak Waeng, Baan Sra Yai and Baan Nongsri, are shallow. Beneath the soils in such areas are layers of gravel sand lump laterite. Soils are of low nourishment quality. If such soils are used for growing crops, some measures must be taken to improve the soil properties.

At certain spots close to the banks of canals, soils are of deep degree and of medium nourishment. In such spots fruit-trees can be grown and good yields can be expected. In addition, some low plains scattering all over in the area can be used for rice farming.

2) Productivity of Soils:

a. Mostly, the land for rice farming must be of low level so that it can be inundated.

1. Tract No.1 of about 8,343 rai scattering in the middle part and southern part of the

middle part and southern part of the project-area, covering some parts of the area in Baan Klong Kwang and Baan Chang Toon, and extending to Baan Tak Waeng and Baan Ma Muang, the area between Klong Pra Deng and Klong Pur and some part of areas in Bann Nong Aeng extending to Baan Klong Kaeng and Baan Sra Yai in the area of Klong Aeng and Klong Goom.

The feature of soils is deep soils of improper water discharging type.

Textures are loams, or sandy clay loams of low nourishment to medium degree of nourishment, with a sloping degree of 0-2%.

2. Tract No.2 of about 450 rai, of which some parts are in the western part of Baan Chang Toon, bordering the areas under the project, the middle part of the area in Baan Hua Tung and Baan Huay Chang Kin Din and some part of the areas on the eastern part of Baan Sra Yai.

The features of characteristics of soils: deep or medium deep soils with improper water discharging nature. Textures are sandy loams of low nourishment, with a sloping degree of 0-2 %.

- b. The areas suitable for growing fruit trees, rubber trees and crops:

General Features: Uplands of wavy plains to steep wavy plains.

Tract No.3 of 46,560 rai, which is a large part under the project area, scattering on the West - the East in the northern part of the project area, while the large part is in the lower part in the north, the middle part and nearly the whole

Features or characteristics of soils:
Shallow type to medium-deep type, of good water discharging. Textures are sandy loams, or gravel loams, of low nourishment, with a sloping degree of 3 - 16%.

Tract No.4 of 1,174 rai, being some part of the areas in the north bordering the East and the West of the project area, in the region of Klong Aeng, Baan Nong Born, Klong Kwang and Baan Suar Dao.

Features or characteristics of soils:
Layer of soils of medium depth, of good water discharging character. Textures are gravel loams of high nourishment, with a sloping degree of 16 - 35%.

Tract No.5 of 14,276 rai, being some parts of the northern area in the region of Klong Aeng, the major part of the area in the West, and the northern region of the southern part of the project area, and the part scattering in the East and in the South of the middle part of the area; and some parts of the southern region in Klong Sano, Klong Pra Deng and Klong Pru.

Features or characteristics of soils:
Layer of soils of reasonable depth. The properties are good water discharging. Textures are clay and sandy loams, medium nourishment to high nourishment with a sloping degree of 3 -16%.

Tract No.6 of about 910 rai, being some part of the length-wise area from Baan Chang Toon extending to Baan Klong Kwang, some part of the area in the eastern part of Baan Klong Kwang, the southern part of Baan Chang Toon in the region of Klong Aeng

in the west of Baan Ta Ngarm and in the south of the Water Reservoir of National Security Division.

Features or characteristics of soils: Layer of soils is deep, the character of soils is of good water discharging. Textures are sandy loams of low nourishment, with a sloping degree of 3 -16%.

c. Gem Mining Areas:

Tract No.7 of 25,270 rai, being the major part of the eastern part in the north and the large part of the middle part of the plain extending to the east; and the big part in the south of the central part of the area under the project.

Features or characteristics of soils: The areas of such places are full of holes and pits with earth heaps, stone heaps and sediment grounds caused by mining operation.

d. Mountainous Areas:

Tract No.8 of 6,455 rai, being some parts of the area in the north, the upper part of the area on both banks of Klong Aeng (Aeng Canal), bordering the project area, some parts of the area in the south of Klong La Gor and Baan Klong Kwang, the large part of areas in the north - south of Baan Nok Chu, the eastern part of Baan Ta Bard in the region of Amphur Bor Rai near Klong Nual, Baan Tak Waeng Lung and the large part of area in the upper part of "Kao Mai" water reservoir in the south of the project area.

Features and characteristics of soils:

Soils with a sloping degree of more than 35%.

(6) Water Sources:

1) Surface-Water:

There are many waterways and canals.

The significant ones are :—

- a. Klong Aeng (Aeng Canal): The sources of this canal are in Ta Baeng Yai Mount in the area bordering Cambodia and Chantaburi Province. Mostly, all waterways and canals in this region will flow into Klong Aeng. Thus the size of this canal, especially the section from Baan Ta Ngarm to the lower basin, is enlarged. This canal flows through the area in the western part from the northern most to the south through many villages, such as Baan Nern Tak Dad, Baan Nong Born, Baan Sua Dao, Baan Nong Mai Horm, Baan Tapong Mark, Baan Chang Toon, Baan Ta Ngarm, Baan Tung Ta Rong and Baan Klong Aeng, respectively.
- b. Klong Cha Nark (Klong Bor Rai). The source of this canal is in Ta Bark Mount, Sum Ngarm Mount, Kaew Mount, Por Mai Mount, flowing through the northern part of the area in Baan Ta Bark, Baan Cha Nark, Baan Tung Praneet (the site of the present Bor Rai District Office) and then into Klong Aeng in the area of Baan Ta Ngarm.
- c. Klong Sanow. The source of this canal is in Kao Bantat (Bantat Mount), Tub Kra Dai Mount, Plai Klong Mount, Ork Tark Mount, Pong See Mount and Klong or Mount. It flows through the area in east of Baan Nonsri (Baan Wai Guay), Baan Klong Sano, and then into Klong Aeng in the area bordering Amphur Kao Sming.
- d. Klong Goom: The source of this canal is in Kong Goom Mount. It flows through the area in the east and then into Klong Sano in the area adjoining Klong Aeng.
- e. Klong Peed: The source of this canal is in Klong Wang

Po Mount, Ed Mount, Tak Waeng Mount, flowing through the southern area of Klong Peed.

All these waterways are natural sources of water on the surface considered essential for agriculture. All of these waterways, however, are adversely affected by the mining operation, caused turbidity and made the water in these canals unsuitable for consumption and agricultural use.

Besides, at certain sections, the waterways are so much shallow that causes shortage of water, especially in the dry season.

In addition to natural waterways, there are small water supply sources excavated by officials and local people, but most of them are for the living consumption, not for agricultural purpose.

2) Underground Water:

From the survey of all the villages and places where water wells being excavated, the level of underground water in different places can be reached at different depths as follows:

For the case of low land at the foot of hills adjoining the rice farm in the area of Na Nao Mount, the depth is
..... 1 metre

But at the foot of hills adjoining rice farm
in Baan Chang Toon: 3 metres

For the case of highland in Baan Chang Toon: 8 - 13 metres

While the highland in Baan Wang Or: 4 metres

At the banks of Klong Peed (Peed Canal): 6 metres

At the highland in the area of Wat Sua Dao: 12 metres

At the sloping section at the foot of hill in
Baan Nong Born: 10 metres

On the mound in the area of Ma Nao village: 7 metres

The above records are from survey made in 1987. Therefore, the levels of water as indicated above are considered as

reference-values only. It is also considered that the underground water will not be enough for agricultural use. If being pumped, the discharge of water will be decreased rapidly. Therefore, this underground water is just enough for the village consumption.

From the climatic statistics and the study of sources of water, it can be summarized that if rain water expected for use in agriculture, plants can be grown during the period of 7 months or use in agriculture from April to October. But if fruit trees are to be planted, this would need a development of sources of water for use in the dry season. It is considered of high potential that such development can be made, since there are many natural canals available in the areas which can be turned into a proper irrigation system. Besides, the availability of low lands between hills, such lowlands can be made into small water reservoirs for use in farms and fields.

II. PROJECT-FORMULATION

2.1 Project-Objectives

From the present devastation of lands (deforestation, destruction of top soil and disorder of land configuration by mining exploitation) as well as water resources (pollution, sedimentation and a perishable situation of marine products) resulted in a serious menace to changes in ecological conditions of the region, two (2) main objectives of the project are considered as follows:

(1) Environmental conservation of lands and water resources by engineering measures for avoiding further environmental damages and restoring a normal situation of these environmental conditions.

(2) Implementation of an integrated agricultural development for securing the environmental conservation and grading up living conditions of local inhabitants suffering from presently low income living conditions and insufficient employment.

From these 2 basic objectives related aspects are considered as follows.

a. To develop the area with sufficient infra-structures for regional development.

b. To develop the area with proper institutions for economic development.

c. To construct a Center for Environmental Conservation in the East.

2. 2 Project-Components

From the above objectives of environmental conservation and integrated agricultural development, project-components are considered as follows:

(1) Land Reclamation

As mining exploitation will be continued on lands reserved for this purpose, land-portions in the mining reserved area subjected to the project-area shall be confirmed by the Provincial Office. Besides, the future land reclamation of portions in mining operation shall be done by these corresponding exploiters with a strict regulation after each exploitation.

(2) Control of Waterways

As sedimentation is an obvious cause from mining operation to improper water for agricultural purpose as well as destruction of mangroves, a system of water-controlled structures with sand saving dams, reservoirs and conduits shall be subjected to the main components of the project for both purposes: prevention of sedimentation and water-use in agriculture.

(3) Plantation

As most land of the project-site are uplands, crops considered for the project-area are rubber trees, orchards and legumes upon the suitability of each land-portion and concerned conditions.

Forestration, therefore, is an important part of this component.

(4) Agri-Business Development

Agro-industries and livestock-industry shall be a component subjected to the project.

A combination of pasture with orchard plantation shall be considered accordingly in order to support livestock development.

Agro-industries subjected to the project to be considered would be rubber-products, agro-processing and, dairy industries.

(5) Infrastructure-Construction

As there is a significant lack of infrastructures such as access-roads to each Ban in the project-site as well as commune-institutions such as schools, hospitals, housing and utilities-facilities, infrastructures are subjected to a component of the project.

Also with the consolidation of proper infrastructures, regional development will be made up, forming conditions for tourist development accordingly.

(6) Center for Environmental Conservation

A Center for this purpose of environmental conservation associated to DLD Region 2 shall be subjected to components of this project.

This Center could be constructed in some proper place in DLD Region 2 for dealing with this matter in the whole region, especially from Pattaya to Trat where serious damages to environmental conditions have been observed.

Staff members of the Center shall be DLD official with experts from technical cooperation.

(7) Tourism Development

With the conservation of natural conditions combined with infrastructure development, tourism shall be an ample business for Trat Province which possesses many scenic spots such as islands, sea-shores, border-areas and gem-business.

However, with the development of tourist industry, further applications for environmental conservation shall be considered accordingly.

2.3 Proceeding-Procedure

In order to implement the project, 2 parts, formulation of the

master plan and project-implementation, are considered indispensable in accordance with the proceeding procedure.

(1) Formulation of the M/P

A study shall be carried out for formulating the M/P which is considered as the basic document for implementing concerned aspects such as engineering, sectoral application, management-network and financial sources for the project.

This study shall be carried out in the frame work of technical cooperation i.e. JICA where the environmental issue is considered at high priority.

The Government of Kingdom of Thailand, therefore, shall be request a technical cooperation to i.e. Government of Japan via its Embassy in Bangkok for this M/P Study.

Survey-documents of the project-area made by DLD in 1988 shall be served as basic data materials for this Study.

(2) Project-Implementation

After approximately 1 year of Study, the M/P will be finalized, envisaging concrete subjects and proposed schedules for each related implementation.

The total project would be implemented during a period of 5 - 10 years.

Financial sources of each subject are subjected to be consulted between the Kingdom of Thailand and the financing country.

III. SCOPE OF STUDY

3.1 Outlines of the Study

The study will cover 2 main aspects, the environmental conservation of the region and the integrated agricultural development in these upland areas.

Due to climatic conditions, the study shall be made into 2 phases,

Phase I : Survey in wet season of all areas in Trat Province, especially Tambol Nong Born and related coastal areas.

Phase II : Survey in dry season with further detailed investigation of each portion in Tambol Nong Born corresponding to each proposed development feature.

Description of Phase I : Preliminary Study

- (1) Collection and review of existing data and information
 - a. Natural Conditions
 - b. Socio-economic conditions
 - c. Agriculture
 - d. Irrigation and Drainage

- (2) Execution of field-surveys and investigation
 - a. Field reconnaissance survey
 - b. Geological investigation
 - c. Irrigation-scheme at proposed sites
 - d. Farming practices

- (3) Interpretation and analyses of data and information
 - a. Meteo-hydrology
 - b. Geology
 - c. Others

- (4) Preliminary Master-Plan
 - a. Irrigation-system

- b. Land-use plan
- c. Agro-industrial development plan
- d. Infrastructure plan
- e. Tourist development plan

Description of Phase II : Finalization of Master Plan

- (1) Additional data information collection
- (2) Execution of field survey and investigation
 - a. Topographic Survey
 - b. Hydro-Meteorology Survey
 - c. Agricultural Survey
 - d. Agro-industrial Survey
 - e. Agro-economic Survey
- (3) Interpretation and analyses of data and information
- (4) Finalization of Items in the Master Plan
 - a. Land Use Planning
 - b. Basic Design of Irrigation Scheme
 - c. Cropping Pattern per Different Portion
 - d. Basic Design of Agro-Processing and Marketing Institutions.
 - e. Infrastructure and Tourism Development Plan
- (5) Formulation of Implementation plan and schedule
- (6) Benefits and costs estimates
- (7) Project-Evaluation
- (8) Preparation of the Final Report

3. 2 Proposed Work Schedule

The study is expected to be conducted within one year as illustrated in the table of proposed Work Schedule with 10 engineers and experts.

A total of approx. 81 manmonths is formulated for this Study which would be considered as follows.

	Phase I		Phase II		Total
	site	homework	site	homework	
1. Team leader cum Planning/ Land Reclamation	2.0	2.0	2.0	2.0	8.0
2. Sub leader cum Dam Engineer	3.0	1.5	2.5	2.0	9.0
3. Civil Engineer	2.0	1.5	2.5	1.5	7.5
4. Surveyor and Designer	2.0	1.5	2.5	2.0	8.0
5. Irrigation	3.0	2.0	2.5	2.0	9.5
6. Pedologist	3.0	1.5	2.0	1.0	7.5
7. Agronomist	3.0	2.0	2.25	1.5	8.75
8. Socio-Economist	2.0	2.0	2.0	1.0	7.0
9. Livestock and cum Agro-Industry Specialist	2.0	1.5	2.0	1.5	7.0
10. Environmental Speci- alist cum Project Evaluation	3.0	1.5	2.25	2.0	8.75
					81.00

APPENDICES

AGRICULTURAL DEVELOPMENT CONSULTANTS ASSOCIATION
(ADCA)
TOKYO-JAPAN

A FIELD SURVEY REPORT
ON PROJECT FINDING IN TRAT PROVINCE

PROJECT OF ENVIRONMENTAL CONSERVATION AND INTEGRATED AGRICULTURAL DEVELOPMENT
FOR TAMBOL NONG BORN IN TRAT PROVINCE

(ADCA Project Finding Team : Messrs. B.ABE and T.SUMITOMO
March 11 - 21 1990)

The project-finding team despatched by ADCA to the Kingdom of Thailand as per the attached schedule had made a reconnaissance-survey at Tambol NONG BORN of Amphur BO-RAI in TRAT Province as well as field-discussions with officials of TRAT Province and DLD Region 2 about the possibility of a Japanese technical cooperation for this project.

The total area of Tambol NONG BORN is about 104,000 rai in which lands subjected to the project-area, uplands and lands for mining-exploitation, covering approx. 60 percents and 25 percents of the total area, respectively.

In Uplands, areas apart from plantations of rubber and fruit trees, and national forests have been gradually deforested ; while many areas for mining exploitation are in operation with various places have been abandoned here and there, along the access-road to Nong Born, after digging for this purpose.

Of the total population in Tombol NONG BORN more than 60 percents of the people are engaged in mining works, while only 35 percents are living on farming. The average annual income per family is reportedly below than 10,000 Baht, which is lower than the average income of Trat Province and one of lowest incomes in the whole country of Thailand.

The project-finding team visited also mangrove areas at the outlet of Trat River which have been gradually destroyed by various exploitations in the region in which sediment-precipitation come from mining exploitation in upper parts of the region has been considered as one of the major causes.

From our discussions with local officials, a project for grading up living conditions of local inhabitants in Nong Born combing with natural environmental conservation especially mangrove areas and abandoned areas from mining exploitation in Trat Province is urgently needed.

PROJECT - OBJECTIVES :

Project-objectives, therefore, are considered as follows :

1. To conserve environmental conditions, especially lands and waters in the region.
2. To develop these natural resources for human benefits which agricultural development is the main part.
3. To grade-up living conditions of local inhabitants for stabilizing this border-region.
4. To develop the area with sufficient infra-structures for inhabitants basic life.
5. To support the land development and land-use planning in the East .

PROJECT-FORMULATION :

1. Land Reclamation of abandoned areas from mining exploitation.
2. Conservation of water resources in Tambol Nong Born by Regulators for avoiding sediment precipitation in lower parts of Trat River.
3. Agricultural development of uplands and areas after mining exploitation.
4. Development of crop-plantations such as rubber and fruit-trees, and related agricultural-developments such as livestock, agro-industries and related agri-business.
5. Development of infra-structures for supporting regional development and tourism in the region.

PROJECT-PROCEDURE :

1. Making the T.O.R. .
2. Request of Japanese assistance (technical survey) .
3. Conclusion of Scope of Works between contact-mission of Japan and Thai Government.
4. JICA survey-team to Thailand for M/P of the project.
5. Request to foreign source(s) of assistance for implementing project-components.

CONCLUSION :

This project is firstly considered important for environmental conservation of land and water-resources in the East of the country, bordering Cambodge, where deforestation and mining-exploitation have gradually destroyed environmental conditions in the region, especially mangrove forests and ecological conditions of water at outlets of rivers in the region.

The project is for purpose of basically supporting the land-development and land-use in this region, as well as regional development of local government.

The project is also aimed at the improvement of living conditions of local inhabitants in the East by means of agricultural development and related business.

Made in Bangkok, 20 March 1990

ADCA Project Finding Team

ADAC PROJECT FINDING MISSION SCHEDULE

(Project of environmental conservation and integrated agricultural development for Tambol Nongborn in Trat Province)

1. March 11.1990 (Sunday) : Arrival to Bangkok by TG 641.
2. March 12.1990 (Monday) : Am.: Meeting w. Director of DLD
Region 2
Mr. Yamamoto, JICA Expert
Pm.: Meeting w. Dpt. Director General
" " (Mr. Boonyaruk Suebsiri)
" " Mr. Manu Omakupt (Director of
" " land Useplanning Division)
3. March 13.1990 (Tuesday) : Visit to DLD Region 2
Meeting w. Director of DLD Region 2
" " DR. Pornchai Suthatorn
" " Mr. Udom Pulsawath
4. March 14.1990 (Wednesday): Am.: Visit to DLD Kantaburi station
meeting w. Mr. S. Sittisomwong
Pm.: Visit to Trat Provincial
Office meeting w. Deputy
Governor . Field. visit to
Mangrove Areas at the outlet
of Trat river.
5. March 15.1990 (Thursday): Field visit to areas of mining
exploitation. Return to DLD Region 2
6. March 16.1990 (Friday) : Am.: Meeting w. DLD Region 2
Pm.: Return to Bangkok.
7. March 17.1990 (Saturday) : Making the report.
8. March 18.1990 (Sunday) : Making the report.
9. March 19.1990 (Monday) : Meeting at DLD Head Office.
10. March 20.1990 (Tuesday) : Courtesy visit to Japan Embassy,
and JICA Bangkok Office.
11. March 21.1990 (Wednesday): Departure for Japan by TG 640.

TECHNICAL COOPERATION FOR AGRICULTURAL DEVELOPMENT BY THE JAPANESE GOVERNMENT

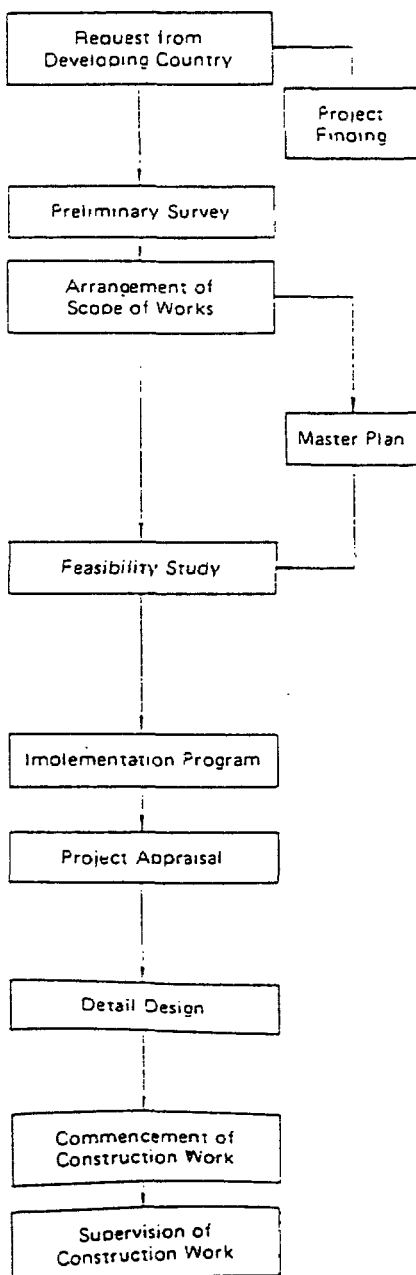
The present-day world economy is increasingly becoming strongly interdependent of each nation. Japan, too, has hitherto heavily relied on other countries to develop her economy through investment and trade. Therefore, it is indispensable for this resource-lacking-nation to further solidify her friendly relations with other countries.

In a bid to fulfill her responsibilities in the world economy, the Japanese Government is positively rendering economic and technical assistance to developing countries.

To cope with the rapidly increasing population and the deteriorating food situation on a global scale, the Japanese Government is promoting the 'Agricultural Development Technical Cooperation' as an important part of one solution to these problems. However, as the number of government engineers is limited, technical engineers from various consulting companies also participate in such governmental projects.

The Agricultural Development Consultant Association (ADCA) was established to facilitate overseas technical cooperation for agricultural development by the Japanese Government with a membership of consulting companies.

The outline and order of agricultural development technical cooperation rendered by the Japanese Government are as follows:



1) The proposal is prepared by the partner country and submitted to the Japanese Government.

2) Project finding is conducted by the partner government directly or by the Japanese consulting company subsidized by the Japanese Government.

1) Investigation of present agricultural conditions, collection of information and data, reconnaissance of a proposed site, and other studies are carried out.

2) A Preliminary Survey Report is compiled and submitted to the partner government.

3) The Japanese Government appropriates the all budget and sends personnel for a survey.

1) A master plan is drafted and the next series of survey of the project site is commenced according to priority.

2) The drafting of a master plan is sometimes omitted.

1) A feasibility study includes a topographical survey, and investigations of soils, water source, irrigation, and drainage, etc.

2) A feasibility study report is compiled and submitted to the partner government.

3) Both the master plan and feasibility study will be carried out by the consulting company with the expenses borne by the Japanese Government.

1) Based on the feasibility study report, the partner government will decide whether to conduct the project concerned.

1) The project appraisal will be performed by the World Bank, Asian Development Bank, etc., to decide on the amount of loan.

2) Either the partner government bears the expenses or the Japanese Government extends a yen credit.

1) The expense for detail design will be appropriated from the project cost.

2) The detail design of the construction work will be carried out by the consulting company.

: NATIONAL RESERVED FORESTS AND SEPERATED REGION
 IN THE REGION OF TUMBOL NONG BORN IN AMPHUR BOR RAI OF TRAT PROVINCE

รูปที่ 2 แผนที่แสดงเขตป่าสงวนและพื้นที่นอก

บริเวณที่ขอแยกต่างหากตามเขตแดน ตามมาตรา 647 จ.ร.พ.ศ. 2517

พื้นที่ขอแยกต่างหาก
 ซึ่งไม่รวมอยู่ในเขตโครงการ
 (ตามกฎกระทรวงฉบับที่ 647 พ.ศ. 2517)
 AS PER OFFICIAL LETTER NO.6361/5688
 OF MARCH, B.E.2518

(BAAN NONG BORN)

๗ (NORTH)



มาตราส่วน 1 : 100,000
 SCALE 1:100,000

พื้นที่ขอแยก - ป่าสงวนในเขตป่าสงวนในเขต
 (ตามกฎกระทรวงฉบับที่ 647 พ.ศ. 2517)
 KAO SMING FORESTS, KLONG YAI FORESTS,
 KAO FAI MAI FORESTS AS PER MINISTERIAL
 REGULATION NO.647 B.E.2517

(BAAN SUAR DAO)

(BAAN KOR LAE)

(BAAN TA PONG MAK)

(BAAN KLONG KWANG)

(BAAN NOK CHU)

(BAAN CHANG THUN)

(BAAN PA AR)

(BAAN TAR BART)

(NONG AENG)

(BAAN NONG AENG)

(AMPHUR BOR RAI)

(BAAN TAR NGARM)

(*)

พื้นที่ขอแยก - ป่าสงวนในเขตป่าสงวนในเขต
 (ตามกฎกระทรวงฉบับที่ 647 พ.ศ. 2517)
 KAO SMING FORESTS,
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 AS PER MINISTERIAL
 REGULATION NO.647
 B.E.2517

(BAAN KLONG AENG)

(BAAN MA MUANG)

(BAAN SA YAI)

(BAAN NONGSRI)

(KLONG AENG)

(KLONG GOOM)

(KLONG SANOW)

(*)

สัญลักษณ์แผนที่ (LEGEND)

- อำเภอ (AMPHUR)
- หมู่บ้าน (VILLAGE)
- ทางหลวง (NATIONAL HIGHWAYS)
- - - - - ทางลูกรัง (ROUGH ROAD)
- ~ ~ ~ ~ ~ ลำธารหรือลำน้ำที่มีน้ำตลอดปี (STREAM OR BROOK WHICH HAVE WATER WHOLE YEAR)
- ~ ~ ~ ~ ~ ลำธารและลำน้ำ (STREAM AND WATERCOURSE)
- ○ ○ ○ ○ เขื่อนกั้นน้ำ (WATER RESERV. RS)
- — — — — ขอบเขตโครงการ (PROJECT BOUNDARY)
- ▨ ▨ ▨ ▨ ▨ บริเวณที่แยกออกจากเขตป่าสงวน (THE REGION OF FORESTS AND SEPERATED REGION)

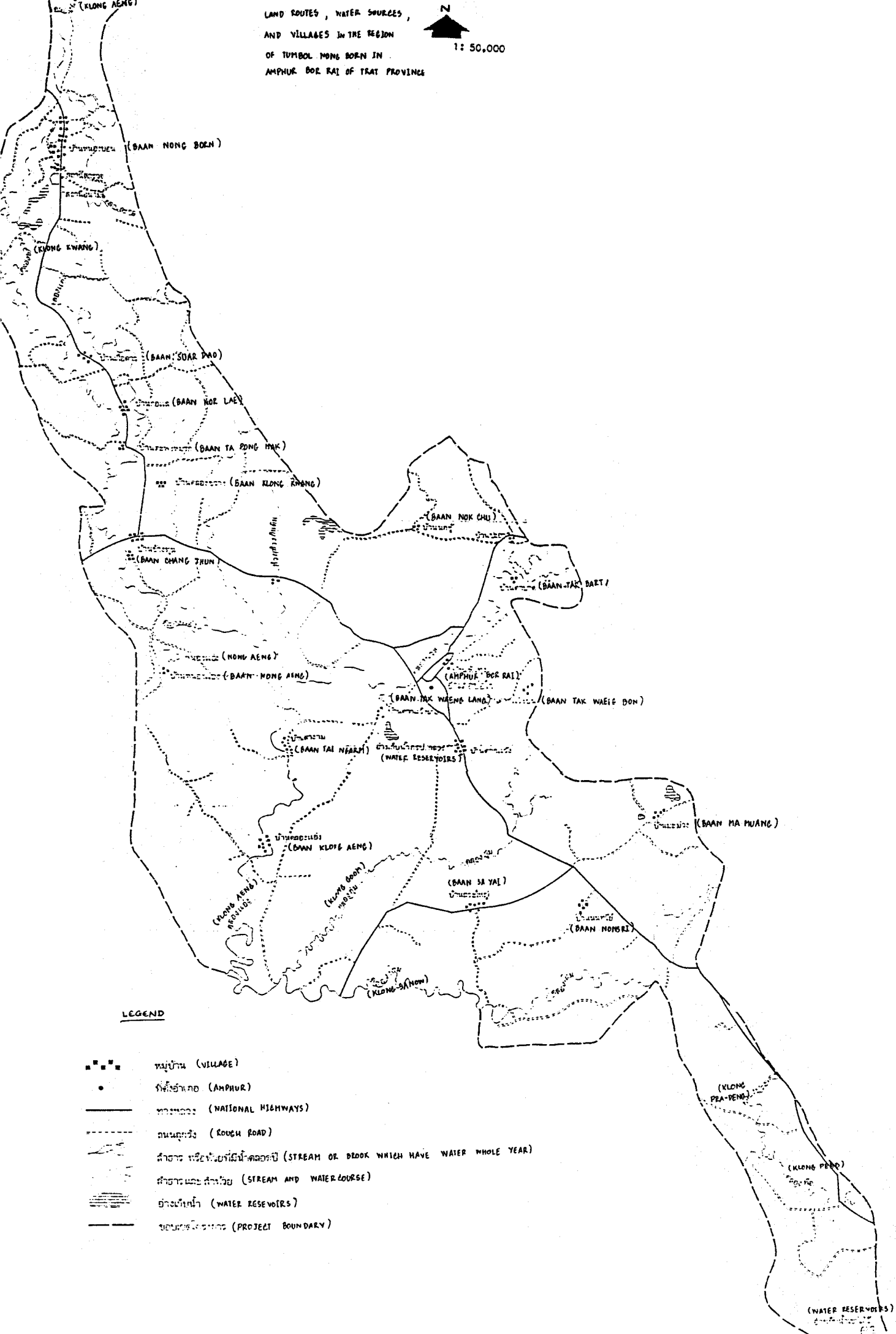
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




(*) THE REGION THAT HAVE BEEN SEPERATED FROM THE NATIONAL FORESTS ACCORDING TO THE RESOLUTION OF THE GOVERNMENT.

LAND ROUTES, WATER SOURCES,
AND VILLAGES IN THE REGION
OF TUMBOL MONG BORN IN
AMPHUR BOR RAI OF TRAT PROVINCE



1: 50,000



- 
 บ้าน (VILLAGE)
- 
 อำเภอ (AMPHUR)
- 
 ทางหลวง (NATIONAL HIGHWAYS)
- 
 ทางลูกรัง (ROUGH ROAD)
- 
 ลำธาร หรือ ลำน้ำที่มีตลอดปี (STREAM OR BROOK WHICH HAVE WATER WHOLE YEAR)
- 
 ลำธาร และ ลำน้ำ (STREAM AND WATER COURSE)
- 
 อ่างเก็บน้ำ (WATER RESERVOIRS)
- 
 เขตโครงการ (PROJECT BOUNDARY)

(WATER RESERVOIRS)