

**タイ国・ガオ石炭盆総合開発計画調査
(作業監理)
現地調査報告書**

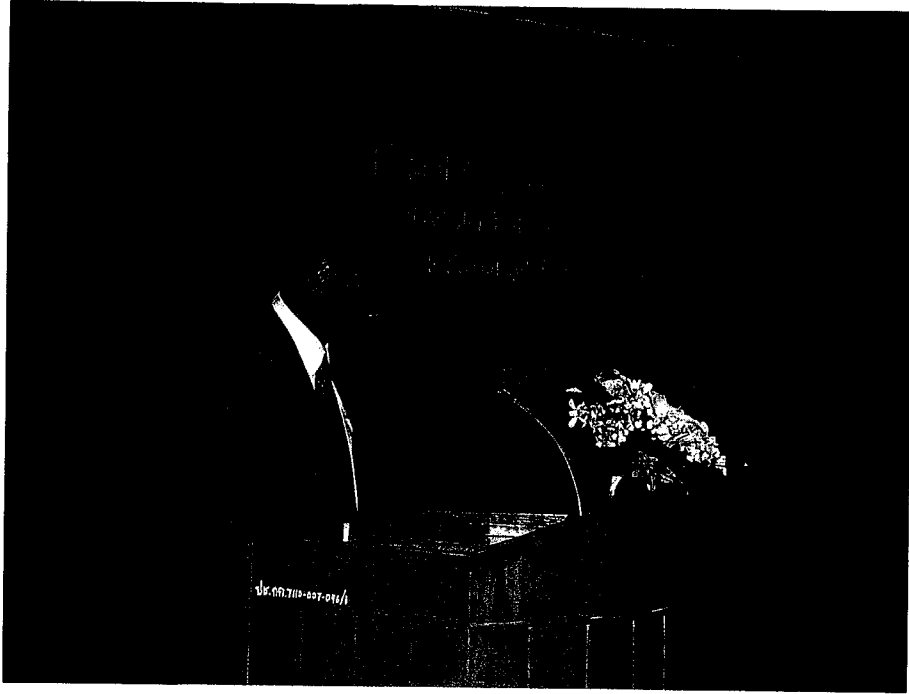
2002年2月

**国際協力事業団
鉱工業開発調査部**

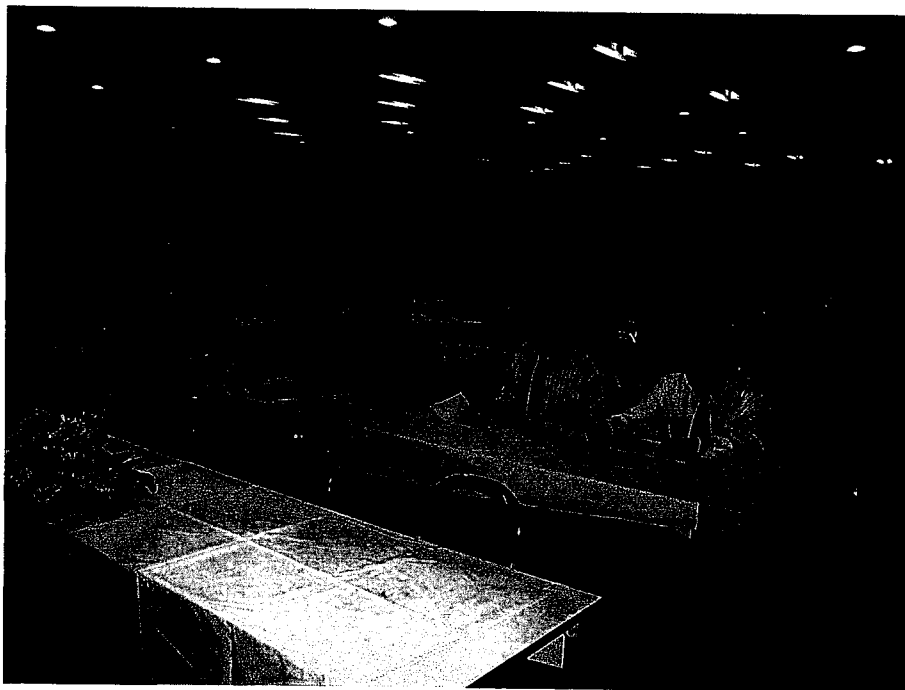
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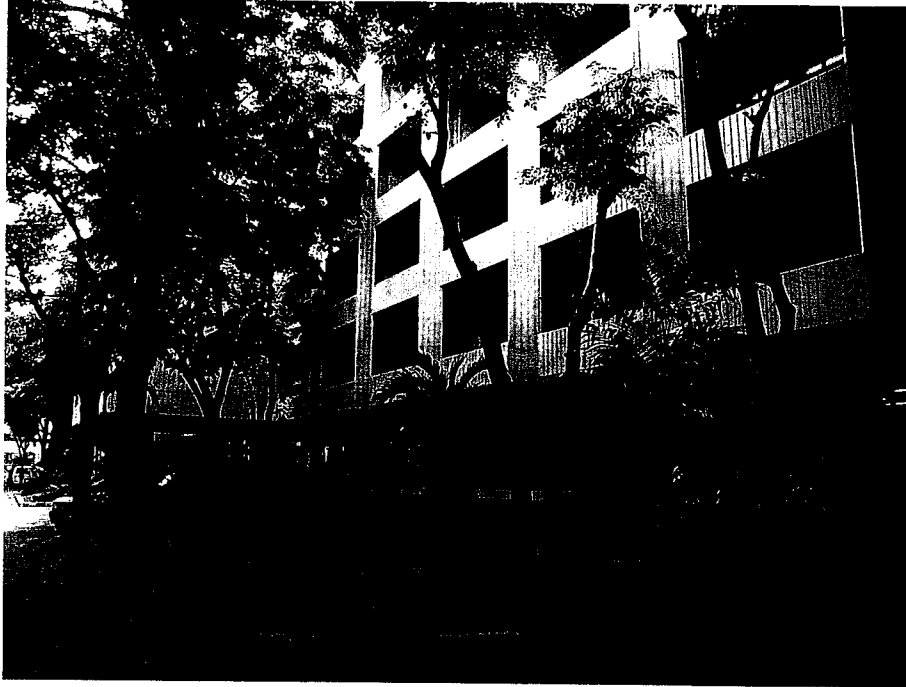
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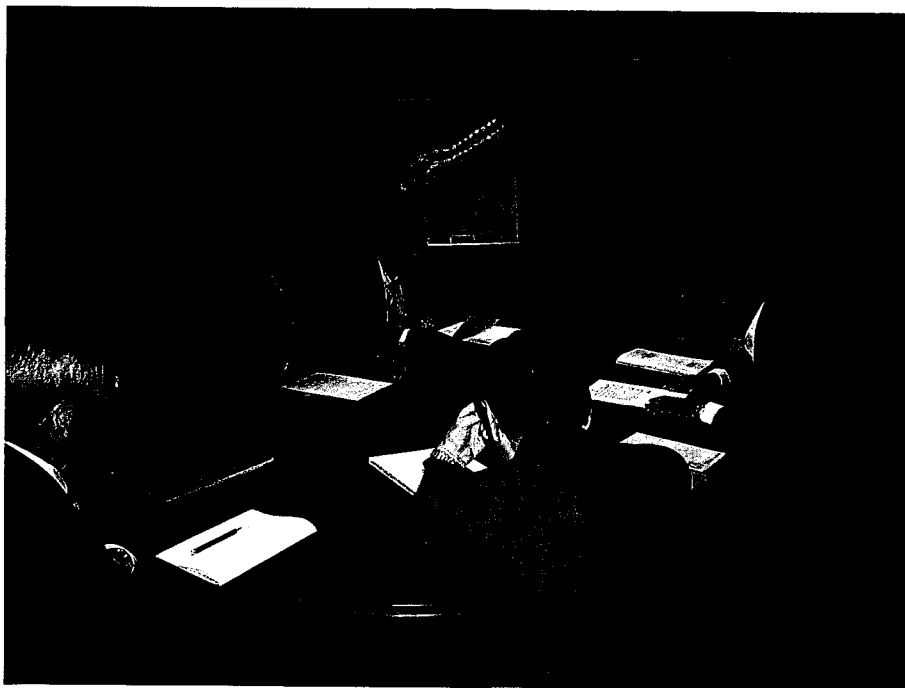
蔵方団長挨拶（技術移転セミナーにて）



会場の様子



Department of Mineral Resources (DMR) のオフィス



協議風景

タイ・ガオ石炭盆総合開発計画調査

(作業監理)

現地調査報告書

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第一章 総論

1. 調査の背景・経緯

タイ国のエネルギー需要は、1980年以降の経済成長に比例して急速に増加している。タイ政府は、今後の電力消費の大幅な増加及び、セメント産業用燃料とした石炭需要の増加により、エネルギーの安定供給を行うためには、国産エネルギーである石炭の埋蔵量の確認が極めて重要であると認識しており、工業省鉱物資源局（Ministry of Industry, Department of Mineral Resources : DMR）を担当機関として、1987年から石炭探査・評価プロジェクト（Coal Exploration and Assessment Project : CEP）を実施した。

DMRは第6次・第7次国内経済社会開発計画（National Economic and Social Development : NESD）（1987～1996）のもと、CEPを実施を促進した結果、45箇所の石炭盆から19箇所の石炭開発有望地域を見出し、8億7千万トンの石炭埋蔵量を新たに確定した。また、有望3石炭盆に関する「石炭探査・評価調査」実施の要請書が日本政府に提出され、JICAによる本格調査が1995年6月から1997年12月まで実施された。第8次国内経済社会開発計画（1997～2001）では、DMRが10鉱床以上の開発調査を実施し、これにより19有望石炭盆が発見された。DMRは有望石炭盆の一つであるガオ石炭盆を対象としたF/S調査の実施を主な内容とする要請書を1997年及び1998年11月に提出した。

一方、同国では、1996年以降の輸出の伸び悩みや経常収支赤字の拡大が、深刻な不動産不況を招き、為替制度の実質的変動相場制移行に伴い、パーツが大幅に下降し経済危機が発生した。これらのことから、同国では石炭の海外依存度を下げていくことを国策としており、国産の石炭に対する需要も増加傾向になると予想されることから、増加する需要に見合う国内石炭の開発を早急に検討する必要性が生じた。

その後の情報において、経済危機以前に策定していた輸入炭による石炭開発計画も延期されていること及び、品質特性の悪さはあるものの改質技術を導入した国内炭の利用が緊急の課題であることが判明したため、先方関係機関との協議を通じて、石炭需要の展望及び、本格調査実施の必要性を確認し、ガオ石炭盆総合開発計画における開発調査の枠組み（調査内容・対象地域・時期・期間）を策定することを目的とし、1999年12月に予備調査団を派遣した。本格調査の内容について協議を行った結果、先方側も国内炭の品質特性が悪いこと

を十分承知した上で、代表的品質を有するガオ石炭盆の技術的・経済的観点からの利用可能性を期待して JICA に要請した案件であり、改質技術導入の可能性検討が必要不可欠であることを双方で認識し、双方の間で協力内容に関する合意が得られたため、1999年12月21日に実施細則（S/W）を署名交換した。

2. 調査の目的

本件調査の目的は、ガオ石炭盆総合開発計画に係る最適開発計画の策定（技術、経済・財務、環境の各方面からのフィージビリティ評価）、ガオ石炭盆を対象とした環境影響を最小にする効果的な石炭鉱床開発ガイドラインの策定を行い、併せて石炭鉱床開発手法（石炭探査、埋蔵量評価、効率的採鉱法・選炭法、環境）に関する技術移転を先方カウンターパート機関である工業省鉱物資源局（DMR）に対し実施することである。

しかしながら、上記背景のようにガオ石炭盆の褐炭の品質特性が悪いこと、褐炭の市場が明らかでない等の問題が判明したため、要請内容どおりに本調査を実施することは難しいと判断し、最低限の必要な調査を実施することとした。DMR の調査では地質解析が不十分であり、まず地質解析により可採埋蔵量及び炭層賦存状況を明らかにし、改質技術等を駆使した石炭盆開発基本計画の策定までを Phase 1 として実施することとし、その結果、フィージブルとなる可能性があるかと判断された場合に限り、Phase 2 の F/S 調査を別途実施するものとする。

3. DF/R の内容と作業監理現地調査団の対処方針

JICA が作成した業務指示書においては、フェーズ2を実施するのかどうかの判断基準は改質技術を適用した石炭盆開発計画の経済性によることとしていた。しかし、こうした観点から DF/R の内容について JICA 本部と調査団が検討した結果、石炭の改質技術を伴うガオ炭田の開発については、改質技術の有効性は認められるものの、輸入炭との比較において経済的合理性は現段階においては認められない、との結論を得た。よって、今回の現地調査においては本調査結果を C/P である DMR に説明し合意を得るとともに、フェーズ2は実施しないことを対処方針とする。

一方、1999年12月21日に締結した S/W によると、フェーズ1終了後、フェーズ2に進むかどうかの具体的な判断基準に関する記述はなく、協議の内容

によってはS/Wに抵触する可能性もあることから、DF/R の内容のうち、フェーズ2に進むかどうかについての協議については官団員にて対応することとした。

4. 団員構成

(1) 作業監理調査団

No.	氏名	担当業務	所属	派遣期間
1	蔵方 宏	団 長	JICA 鉱工業開発調査部 資源開発調査課長	01.11.11～01.11.16
2	川田 泰寛	作業監理	JICA 鉱工業開発調査部 資源開発調査課	01.11.11～01.11.16

(2) 本格調査団 (第4次現地調査)

1	松村 稔	総括/石炭開発計画	三菱マテリアル資源開発(株)	01.11.4～01.11.17
2	島 建彦	エネルギー・経済・石炭事情	三井鉱山エンジニアリング	01.11.4～01.11.17
3	河口 雄三	石炭地質・資源評価	三井鉱山エンジニアリング	01.10.31～01.11.15
4	辰元 克充	石炭改質技術	三井石炭液化(株)	01.11.4～01.11.17
5	高橋 毅	石炭採掘技術	三菱マテリアル資源開発	01.10.31～01.11.7
6	宮内 啓	業務調整	三菱マテリアル資源開発	01.11.5～01.11.16

5. 調査日程

日付	日程	宿泊先	備考
11/11(日)	官団員: 11:00 成田発 15:15 バンコク着(JL717)	同上	
11/12(月)	セミナーの開催 現地事務所打ち合わせ	同上	AM, at DMR
11/13(火)	DMR との協議	同上	DMR
11/14(水)	DMR との協議と M/M の作成	同上	DMR
11/15(木)	午前: M/M の締結 午後: 現地事務所への報告	同上	DMR
11/16(金)	帰国(8:15/ JAL708)	同上	成田着 16:05

なお、コンサルタント団員の第4次現地調査は11月4日～11月16日まで実施された。

第二章 協議概要

1. 主要面談者

(1) DMR (Department of Mineral Resources)

Mr.Nares Sattayarak(Senior Experts)

Mr.Somchai Supurtipanish(Senior Geologist)

(2) JICA タイ事務所

高嶋次長、中本職員

DMR と JICA は 11 月 12 日および 13 日の協議を通じ以下のとおり合意した。

2. 協議結果

- (1) 報告書の内容について両者は合意した。特に NGAO 地域の石炭盆の開発について、技術的には改質技術を適用することが効果的ではあるものの、経済的な観点から輸入炭と比較すると、現状においては経済性は得られない。よって S/W の第 3 章にある事項（フェーズ 2 に進むかどうか協議すること）についてはフェーズ 1 をもって終了することとする。
- (2) DMR は今後、エネルギー分野（セメント産業等）における石炭の消費が増加すること及び、その増加分を国内炭にて賄うことの重要性を説明した。JICA は上記を考慮し、DMR にシニアボランティアの要請や石炭開発等の集団研修に参加することを提案した。
- (3) DMR は JICA の提案を受け入れ、両者は今後とも良好な関係に努めることを約束した。

3. 合意した M/M

MINUTE OF MEETING REGARDING FEASIBILITY STUDY ON COMPREHENSIVE DEVELOPMENT OF THE NGAO COAL BASIN IN THE KINGDOM OF THAILAND

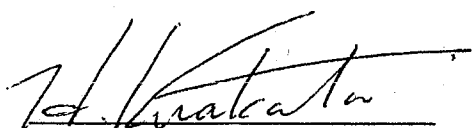
The JICA Team headed by Mr. Hiroshi Kurakata, Director of Energy and Mining Development Study Division JICA, visited the Kingdom of Thailand from November 11 to 16, 2001 for the purpose of discussing the result of the Phase I in the Feasibility Study on Comprehensive Development of the NGAO Coal Basin in the Kingdom of Thailand (hereinafter referred to as "the Study").

The JICA Team had a series of discussions with the Department of Mineral Resources (hereinafter referred to as "DMR"), Ministry of Industry.

Main points of the discussion are as follows.

1. The both sides confirmed the result of the Phase I study, which concluded that the upgrading technology was effective to improve the coal quality, but judging from the comparison with the imported coal, the development of NGAO coal basin using upgrading technology was not economical at present. Based on the article III in the Scope of Works for the Study, the both sides agreed to terminate the Study in the Phase I.
2. DMR explained the importance of the coal development in the country to meet the increasing consumption of the energy in the power generating, cement manufacturing and other industries. The JICA team understood the situation above. Then JICA Team advised DMR to propose JICA the technical assistance through the Senior Volunteer or Group Training in Japan in the field of coal development and related technology.
3. DMR expressed appreciation to JICA's study and both side confirmed to keep the good cooperation in the future.

November, 14, 2001
at Bangkok, Thailand.



Mr. Hiroshi Kurakata
Director
Energy and Mining Development
Study Division
Mining and Industrial Development
Study Department
JICA



Mr. Nopadon Mantajit
Director General
Department of Mineral Resources,
Ministry of Industry

4. 面談記録

(1) JICA タイ事務所

調査団より本調査の経緯、今回現地調査の日程と対処方針について説明した。特に、本調査はフェーズ1をもって終了する予定であることを説明し、事務所側の理解と協力を依頼した。また、C/P との協議で合意を得ることは難航することが予想されるため、場合によっては来年度鉱調部の枠で集団コースに研修生を積極的に受け入れるなどの方法で M/M の合意を取り付け、本件については終了することで合意を得たい旨、説明した。JICA タイ事務所は現在のタイ国における重点課題が①社会開発、②環境、③地方農村開発、④インフラ整備となっており、エネルギー分野の現状は他の分野と比較して逼迫していないこと、またフェーズ2を実施した場合の石炭の用途がセメント用であることから本案件が終了することについて理解を示した。

(2) DMR との協議

本格調査団は DF/R の内容（特に改質技術の技術的な有効性は認められるが経済性については現状においてはその有効性が認められないこと）については既に協議し、DMR と大筋で合意を得ていた。

JICA 調査団は対処方針に従い、フェーズ2は実施せず、調査を終了する予定である旨を伝え理解を求めた。DMR は今後の電力業界やセメント業界における石炭の需要が増加することが予想されることから、フェーズ2の実施やフェーズ1の延長など、引き続き調査を実施することを要望したが、本案件の現状は、グループ研修による技術習得やシニアボランティアの受け入れ等が JICA のスキームでは適切であることを説明し、DMR の了解を得た。

なお、DMR のサイナーは Mr.Nopadon Mandajit (Director General) の予定であったが、18 日まで出張中であるため、JICA 側のみサインし、担当者である Nares 氏に預けた。Nares 氏は1週間以内に Mr.Nopadon Mandajit (Director General) のサインをもらい JICA タイ事務所に提出することを約束した。

付 属 資 料

予備調査時に締結したS/W および M/M

付属資料

SCOPE OF WORK
FOR
FEASIBILITY STUDY
ON
COMPREHENSIVE DEVELOPMENT OF THE NGAO COAL BASIN
IN
THE KINGDOM OF THAILAND


AGREED UPON BETWEEN

MINISTRY OF INDUSTRY
DEPARTMENT OF MINERAL RESOURCES

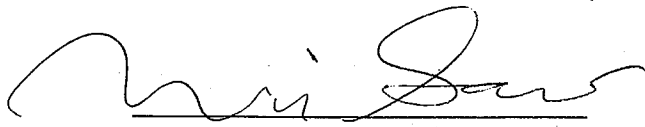
AND

JAPAN INTERNATIONAL COOPERATION AGENCY

BANGKOK, DECEMBER 21, 1999



Mr. Nopadon Mantajit
Director General
Department of Mineral Resources,
Ministry of Industry



Dr. Sano Minori
Leader
The Preliminary Study Team,
Japan International Cooperation Agency

I. INTRODUCTION

In response to the request of the Government of Kingdom of Thailand (hereinafter referred to as "Thailand"), the Government of Japan decided to conduct Feasibility Study on Comprehensive Development of The Ngao Coal Basin (hereinafter referred to as "the Study") in accordance with the laws and regulations in force in Japan.

Accordingly, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programs of the Government of Japan, will undertake the Study in close cooperation with the authorities concerned of the Government of Thailand.

The Ministry of Industry, Department of Mineral Resources (hereinafter referred to as "DMR") will act as coordinating body in relation with other relevant organizations for the smooth implementation of the Study and DMR will be responsible for the implementation of the Study and act as counterpart agency to the Japanese study team.

The present document sets forth the scope of work with regard to the Study.

II. OBJECTIVES OF THE STUDY

The main objectives of the Study are :

1. to assess the country's coal reserves to be ready for development in order to cope with an industrial demand
2. to determine a suitable and effective guideline, with a minimal environmental impact, to develop coal deposits
3. to equip personnel with efficiency and effectiveness in various aspects such as exploration, management, development, and environmental preservation

III. SCOPE OF THE STUDY

The Study will be carried out in the following two (2) Phases :

Phase 1. Basic Design Stage

Phase 2. Feasibility Study Stage

JICA and DMR will discuss about whether Phase 2 should be implemented or not after completion of Phase 1.

Phase 1. Basic Design Stage

- 1) Data Analysis
 - a) Collection of all related existing data, reports and other relevant latest information for the Study.
 - b) Reconnaissance.
 - c) Data Analysis.
 - d) Relevant criteria and manuals.

- 2) Energy Circumstance Survey (whole country / district related Ngao coal development project)
Collection and review of all related existing data, reports and information on energy circumstances.
 - a) Power supply, power consumption, power demand forecast, present and future power system, etc.

- 3) Coal Development Circumstance Survey
Collection and review of all related existing data, reports and information on coal development circumstances.

- 4) Drilling

- 5) Sampling & Testing
 - a) Bulk sampling.
 - b) Core sampling.
 - c) Analysis & Testing.

- 6) Geological Assessment

- 7) Application of Upgrading Technology
 - a) Desulfurization.
 - b) Ash reduction.
 - c) Dewatering.

- 8) Prospect of Coal Cost

- 9) Preliminary Marketing Research
 - a) Power plants.
 - b) Cement.
 - c) Other Industrial plants.
 - d) Local villages.

10) Evaluation of Ngao Coal Basin

Draft Final Report (DF/R) shall be presented at appropriate timing during this stage which shall be finalized through consultation with the Government of Thailand.

Phase 2. Feasibility Study Stage

- 1) Topographic Survey
 - a) Aerial survey and / or Satellite imaging.
 - b) Ground survey.
 - c) Scaling, coordinates system.
- 2) Exploration Drilling
 - a) Drilling plan derived from previous geological data.
 - b) Configuration of drilling method.
 - c) Sampling for coal, roof and floor rock and other minerals.
 - d) Borehole in situ testing for engineering.
- 3) Geophysical Logging
 - a) Corresponding with drilling data.
 - b) Coal and rock property analysis using logging data.
- 4) Sampling and Test
 - a) Coal Quality (Proximate Analysis, Chemical Analysis, Combustion Properties, Physical Properties).
 - b) Physical Strength of Coal and Hangingwall / Footwall materials.
 - c) Float- Sink Test.
 - d) Gas content in coal.
 - e) Hydrology.
 - f) Clay and other minerals.
- 5) Environmental Impact Study

This study shall be implemented based on the environmental laws and regulations in Thailand and the environmental guidelines of Japan Bank for International Cooperation (JBIC) and JICA.
- 6) Evaluation of Coal Reserves
 - a) Geological assessment of coal seams.
 - b) Formulation of coal conceptual model.
 - c) Evaluation of coal reserves.

- 7) Optimum Mine Development Program
 - a) Conceptual Feasibility Study
 - b) Mine size.
 - c) Mining (method and equipment).
 - d) Coal upgrading (method and equipment).
 - e) Coal quality.
 - f) Mine facilities.
 - g) Coal transportation.
 - h) Development and mining schedule.

- 8) Marketing Research
 - a) Power plants.
 - b) Industrial plants.
 - c) Local villages.

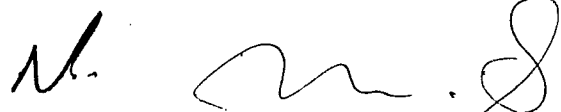
- 9) Formulation of Implementation Plan
 - a) Implementation plan.
 - b) Construction schedule.
 - c) Equipment and materials procurement and transportation plan.
 - d) Environmental preservation plan.

- 10) Cost Estimation

Detailed project cost estimates comprising construction, operation and maintenance with cash flows in foreign and local currencies, and those cost estimates to be based on Thailand price levels and procurement through either international or local competitive bidding as required.

 - a) Market price survey for equipment and materials.
 - b) Land acquisition and compensation cost (if any).
 - c) Construction cost.
 - d) Capital cost / Operation, maintenance and administration cost.
 - e) Cost for environmental countermeasure.
 - f) Freight rate.

- 11) Economic and Financial Analysis
 - a) Economic analysis (EIRR, sensitivity analysis).
 - b) Financial analysis (Cash flow, income statement, FIRR).
 - c) Sensitivity analysis for; construction periods, power demand forecast, schedule, interest rates, etc.



12) Prospective Funding Source

Evaluation of options for funding the Project, recommendation on the preferred funding and preparation of specifications and documentation in relation to the preferred funding option.

13) Formulation of Recommendation

For each of alternatives, description will be made on the advantages, disadvantages and risks, which cannot be quantified. All definitions and comparisons of the alternative optimal plan will be accurate enough to allow decision-making on the priority of the recommended optimal plan as compared to other projects likely under planning at the time of the Study.

Draft Final Report (DF/R) shall be presented at appropriate timing during this stage which shall be finalized through consultation with the Government of Thailand.

IV. STUDY SCHEDULE

The Study will be carried out in accordance with the tentative study schedule as shown in Appendix-1 attached herewith.

V. REPORTS

JICA will prepare and submit the following reports in English to the Government of Thailand in accordance with the tentative study schedule as shown in Appendix-1.

Phase 1

1. Inception Report (IC/R)	20 copies
2. Interim Report (IT/R)	15 copies
3. Draft Final Report (DF/R)	20 copies
4. Final Report (F/R)	25 copies

Phase 2

1. Inception Report (IC/R)	20 copies
2. Progress Report (PR/R)	15 copies
3. Interim Report (IT/R)	15 copies
4. Draft Final Report (DF/R)	20 copies
5. Final Report (F/R)	25 copies

DMR will provide JICA study team with the comments on the Inception Report, Progress Reports and Interim Report during their stay in Thailand and DMR will provide JICA with the comments on the Draft Final Report within one (1) month after its reception.



VI. DIVISION OF TECHNICAL UNDERTAKINGS

The division of technical undertakings of the study by JICA, DMR is detailed in Appendix-2 attached herewith.

VII. UNDERTAKINGS OF THE GOVERNMENT OF THAILAND

1. To facilitate smooth conduct of the Study, the Government of Thailand shall take necessary measures for the following :
 - 1) to secure the safety of the Japanese study team,
 - 2) to permit the members of the Japanese study team to enter, leave and sojourn in Thailand during their assignment therein, and exempt them from alien registration requirements and consular fees,
 - 3) to exempt the members of the Japanese study team from taxes, duties and other charges on equipment, machinery and other materials brought into Thailand for the conduct of the Study,
 - 4) to exempt the members of the Japanese study team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Japanese study team for their services in connection with the implementation of the Study,
 - 5) to provide necessary facilities to the Japanese study team for remittance as well as utilization of the funds introduced into Thailand from Japan in connection with the implementation of the Study,
 - 6) to secure permission for entry into private properties or restricted areas for the implementation of the Study,
 - 7) to secure permission for the Japanese study team to take all data and documents (including permitted maps and photographs) related to the Study out of Thailand to Japan,
 - 8) to facilitate prompt clearance through customs and inland transportation of equipment, materials and supplies required for the study and of the personal effects of members of the Japanese study team, and
 - 9) to provide medical services as needed. Its expenses will be chargeable to the members of the Japanese study team.
2. The Government of Thailand shall bear claims, if any arises against the members of the Japanese study team resulting from, occurring in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Japanese Study Team.
3. DMR shall act as counterpart agency to the Japanese study team and also as coordinating body in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.

4. DMR shall, at its own expense, provide the Japanese study team with the following, in cooperation with other organizations :

- 1) available data and information related to the Study,
- 2) counterpart personnel,
- 3) suitable office space with necessary equipment and facilities in Bangkok and Lampang (Ngao),
- 4) credential or identification cards,
- 5) necessary vehicles with drivers, fuel and spare parts for carrying out field survey,
- 6) communication facilities such as telephone, facsimile, etc. if necessary,
- 7) administrative and technical support staff and labor as needed,

VIII. UNDERTAKING OF JICA

For the implementation of the Study, JICA shall take the following measures :

1. To dispatch, at its own expense, Japanese study team to Thailand,
2. To pursue technology transfer to Thai counterpart personnel during the course of the Study.

IX. OTHERS

JICA and DMR shall consult with each other in respect of any matter that may arise from or in connection with the Study.

ATTACHMENT

Appendix-1

Tentative Study Schedule

Appendix-2

Technical Undertaking by JICA and DMR



Technical Undertaking
by
JICA and DMR

Working Item	Undertaking by JICA	Undertaking by DMR
1. Basic Design Stage		
(1) Data Analysis	Data collection and analysis	Provision of necessary data, report, etc.
(2) Energy Circumstances Survey	Data collection and analysis	Provision of necessary data, report and comments, advice
(3) Coal Development Circumstances Survey	Data collection and analysis	Provision of necessary data, report and comments, advice
(4) Permission of Land Use		Getting Permission
(5) Drilling	Field work and interpretation	Field work
(6) Sampling & Testing (Core Sampling)	Field work and interpretation	Field work and interpretation
(7) Sampling & Testing (Bulk Sampling)	Field work and interpretation	Field work
(8) Geological Assessment	Analysis and compilation	Assistance of analysis
(9) Application of Upgrading Technology	Analysis and compilation	Assistance of analysis
(10) Prospect of Coal Cost	Analysis and compilation	Assistance of analysis
(11) Preliminary Marketing Research	Field work and interpretation	Field work and Provision of necessary data and comments, advice
(12) Evaluation of Ngao coal Basin	Analysis and compilation	Assistance of analysis
2. Feasibility Study Stage		
(1) Permission of Land Use		Getting Permission
(2) Topographic Survey	Field work and interpretation	Field work
(3) Exploration Drilling	Field work and interpretation	Field work
(4) Geophysical Logging	Field work and interpretation	Field work
(5) Sampling and Test	Field work and interpretation	Assistance of analysis
(6) Environmental Impact Study	Field work and interpretation	Field work and Provision of necessary data and comments, advice
(7) Evaluation of Coal Reserves	Formulation	Formulation
(8) Optimum Mine Development Program	Formulation	Formulation
(9) Marketing Research	Field work and interpretation	Field work and Provision of necessary data and comments, advice
(10) Formulation of Implementation Plan	Formulation	Formulation
(11) Cost Estimation	Analysis	Provision of necessary data
(12) Economic and Financial Analysis	Analysis	Provision of necessary data
(13) Prospective Funding Source	Analysis and formulation	Assistance of analysis
(14) Formulation of Recommendation	Formulation	

MINUTES OF MEETING
FOR
FEASIBILITY STUDY
ON
COMPREHENSIVE DEVELOPMENT OF THE NGAO COAL BASIN
IN
THE KINGDOM OF THAILAND

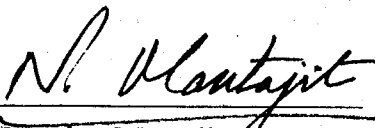
AGREED UPON BETWEEN

MINISTRY OF INDUSTRY
DEPARTMENT OF MINERAL RESOURCES

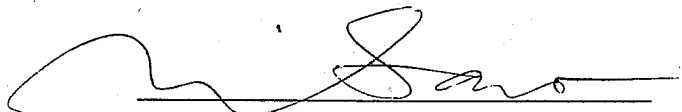
AND

JAPAN INTERNATIONAL COOPERATION AGENCY

BANGKOK, DECEMBER 21 1999



Mr. Nopadon Mantajit
Director General
Department of Mineral Resources,
Ministry of Industry



Dr. Sano Minori
Leader
The Preliminary Study Team,
Japan International Cooperation Agency

The Preliminary Study team (the Team), headed by SANO Minori, Special Technical Adviser, Japan International Cooperation Agency visited the Kingdom of Thailand from December 12, 1999 to December 24, 1999 for the purpose of discussing the Scope of Work for Feasibility Study on Comprehensive Development of the NGAO Coal Basin in the Kingdom of Thailand. The Team had a series of discussions with the Department of Mineral Resources (DMR), Ministry of Industry.

This Minutes of Meeting was prepared to supplement the Scope of Work, which was signed on December 21, 1999, between the Team and DMR.

The both parties agreed upon the following points:

1. Study Area

Study area was mutually agreed as per attached Fig. 1.

2. Conditions of the Study

The conditions on which the feasibility study will be based, are reconfirmed as follows:

2.1 As the condition of economy in Thailand has been changing since the economic crisis of Thailand two years ago, the availability of coal resource in Thailand should be reevaluated.

2.2 It is important to confirm the availability of coal to be produced from the NGAO area in considering the future coal resource development in Thailand.

2.3 The feasibility study will be implemented dividing into two phases. JICA and DMR will discuss about whether Phase 2 should be implemented or not after completion of Phase 1.

2.4 DMR will investigate the policies to promote the use of coal to be produced from NGAO area including a market research.

3. Sampling & Testing (Bulk Sampling)

DMR will provide coal sample from the outcrop of the Ngao Coal Basin for the JICA team in Bangkok.

4. Assignment of Counterpart Personnel

The Team requested DMR to assign the necessary number of counterpart personnel for the Study, and DMR accepted the request.

5. Counterpart Training

DMR requested JICA to accept one counterpart personnel of DMR for technical transfer and joint interpretation in Japan in each stage of the Study, and JICA has taken note for this request and will make the utmost effort to be implemented.

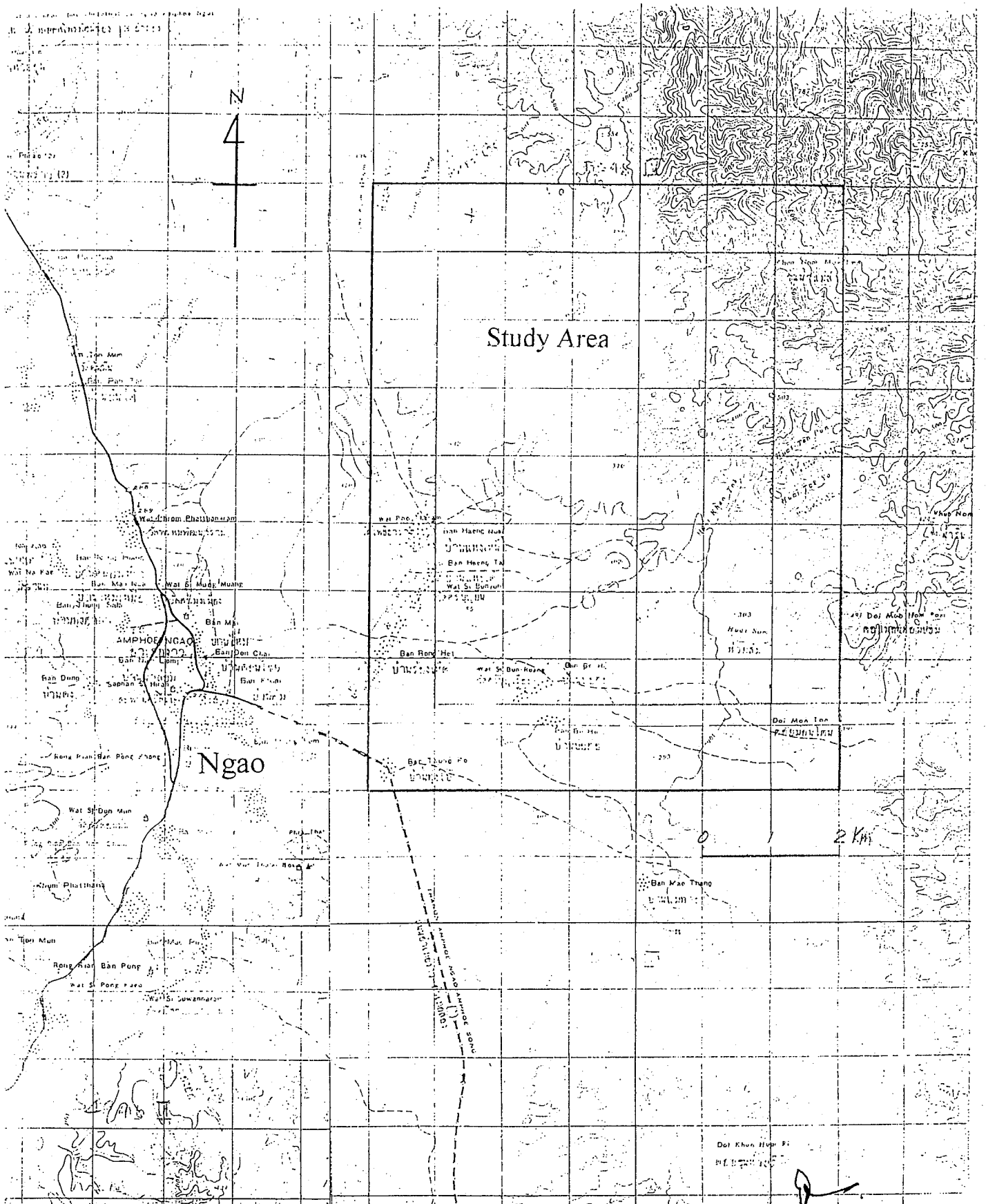


Figure 1 Location of Study Area

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