

3. S/W の協議

(1) 主要問題点

調査団は10/8-27の調査期間中、10/8-11の段階で「マ」側関係機関のS/W案(3.(2)参照)へのコメントをとりつけ、必要なものは請訓の上、10/26までに協議・署名する方針をもって調査日程案を作っていた。

これに対し「マ」側の対応は以下のとおりであった。

EPU: 10/9 インフラ開発課Ms. LEONから「コメントは10/25開催されるステアリングコミッティにてEPUの意見を述べる。それまでは(レターの形式で)コメントの内容を知らせることはできない。」

SESCO: 10/11午前 Deputy General Manager Mr. LING 及び Chief Civil Engineer Mr. SOON から次のとおりコメントがあった。

- *1 - P. 2 III. 1. (2) Comparative Layout Studies の「the previous development plans」に関し、過去の具体的なミニハイドロ(ENEX)等名前を挙げる。
- *2 - P. 2 III. 1. (3) Site reconnaissance の(b)「Ground Surface Surveys」に関し、大規模な機械力を用いたものとミスリードする恐れがあるので、このSurveys が preliminary なものであることを表現に含める。
- *3 - P. 3 III. 1. (5) Site Confirmation の(a)「more than one (1) optimum site」に関し、スリアマン、リンバン、サリケイ、カピットの4都市近傍で1つずつ optimum site を選定することとする。そして4サイトが選ばれた後、「マ」側が技術的、経済的な面から判断して3サイトにしぼり込むこととする。
- *4 - P. 6 III. 3. (5) Economic Project の終了後、「建設業者選定の為の資料作成」をF/Sにて行なう。
- *5 - P. 10 VIII UNDERTAKING OF THE GOVERNMENT OF JAPAN に、C/P の受入れを含める。
- *6 - P. 11 Appendix I. Tentative Time Schedule の Feasibility Design Stage は「マ」国内で行う。これは技術移転をはかること、これまでの西独、ニュージーランドの調査では行っていること、SESCOにはコンピューターもあり、また資料も利用しやすいこと、が理由である。
- *7 - P. 11 Appendix I. Report の Progress Report を monthly とする。
- *8 - P. 12~14 Appendix II. Undertaking of the Government of Japan に関しては、「以下の調査はSESCOのC/P と共に行われる」とし、各項にある「together

with SESCO C/P」をとる (2.1.4, 3.1.4, 3.2.5, 3.4.5, 4.2)。

以上SESCOのコメントに対し、日本側の考えを述べた上で、*4については了解をとりつけた。そのうち、SESCOとしては文言をどう変更したいのか質したが、タイプした形では出なかった。

また10/11午後、SPUに対し調査団がS/Wを示したところ、UNDERTAKINGに関し、「マ」側のカウンタードラフトから変更されているのはどこか、との質問があったので、3ヶ所(P. 8, VII (3)に「and out of」を加えた、P. 8, VII (5)をサバ州資料S/Wにあるので加えた、P. 9, VII (2) (C)で「the Project Site」となっていたものを「the Study Site」とした)あることを示した。SPU側からはこの他に、具体的に文言をどう変えたいか、のコメントは出なかった。

この後、調査団はプロジェクトサイトでの踏査を行うためクチンを離れた。踏査終了後、東京より来マした鈴木団長を加えて、10/22よりS/W協議を再開した。

10/22より再開したS/W協議においては、10/11の協議段階にて問題となった諸点のうち、*6のFeasibility Design Stageを「マ」で行うことについて協議を行ったが、「マ」側の理解は得られなかった。

10/23、団内において「マ」側のコメントについての対処ぶりを協議した上、10/24、SESCOとの間で10/25のステアリングコミッティの打合せを行うこととした。

10/24、SESCOとの協議の場において、SESCOのコメントを加えたカウンターS/W案(3. (3) 参照)が出され、その変更内容についてMr. SOONより説明があった。これに対し、日本側は「マ」の変更内容はJICAが当然考慮して行うことであり、ここまで細かく記述することは、G-Gベースの文書では行っていない。SESCOの言う変更内容はコンサルチームの作成するInception Reportにて協議、記載されるべき事項がほとんどである。SESCOのコメントは「JICAがコンサル選定の際伝える。」旨説明した。これに対し、SESCOは「JICAとSESCOの間ではScope of Studyの大筋では合意しているが、細部をよりはっきりさせたい」旨発言があった。

このカウンタードラフトS/Wが日本側案と異なる箇所は以下のとおり。

*9 - 表紙 調査表題を「ON SARAWAK SMALL SCALE HYDROELECTRIC POWER DEVELOPMENT PROJECT IN MALAYSIA」から「OF SMALL SCALE HYDROELECTRIC POWER PROJECTS IN SARAWAK, MALAYSIA」に変える。

*10 - P. 1 I. INTRODUCTION の中で「(hereinafter referred to as "the Study")」を削除する。

- *11-P. 1 I.の中で「Sarawak Small Scale Hydroelectric Power Development Project」を「Small Scale Hydroelectric Power Projects in Sarawak」とする。
- *12-P. 1 II. OBJECTIVE OF THE STUDY の「最適計画を立案し、そのフィージビリティを評価する」旨の表現をより詳しく述べ「スリアマン、サリケイ、リンバン、カピットの4ロードセンターへ電力を供給する計画を立て、そのviability および feasibility を評価する。その際、長期河川流量資料、将来の電力需給計画（2010年まで）、代替発電案との経済性検討を考慮に入れる。また調査は海外、国内での同種調査により専門的経験を持ったコンサルタントにより行われ、国際的な融資機関が調査を評価する際のガイドラインに充分合ったものでなければならない」とする。
- *13-P. 2 III. 1. (2) を削除する。
- *14-P. 2 III. 1. (3), (C) のあとに新アイテム「Preliminary hydrological study」を加える。
- *15-P. 2 III. 1. (4), (a) Selection of the site(s)の内容をよりブレイクダウンして「Preliminary Layout Study をする際に、発電規模、全構造物についての主要寸法、タイプ、発電機数、電気設備、機械設備、送電線網を決定し、建設コスト、利益を算定し、それらの計画が既存及び将来の電力需要を満たす」旨の表現にかえる。また「optimum site(s)を選定する」を「4つの地域-スリアマン、リンバン、サリケイ、カピットそれぞれについて1つずつoptimum site を選定する」と変える。
- *16-P. 3 III. 1. (5), (a) の中で「1つ以上の optimum site を選定する」旨の条件づけを「SESCOがこれまでの調査で選定された4つの optimum sites から best site(s)を選定する」に変える。
- *17-P. 3 III. 1. (5), (b) の中で「optimum site(s)」を「(I. 1. (5), (a)で選定された) selected site(s)」とする。
- *18-P. 3 III. 2. Field Investigation Stage の前文中「the following will include, but not necessarily limited to the followings」とする。
- *19-P. 5 III. 2. (4)の(a)~(c)の項目分けをやめ、内容を更にブレイクダウンさせる（人口成長と需要予測を2010年までについて考慮する）。
- *20-P. 5 III. 3. Feasibility Design Stage の前文中「the results」を「the initial results」とし、「the following will be carried out」を先の*18と同じく「but not necessarily limited to」を加える。
- *21-P. 5 III. 3. (1), (a)の中で「the demand」を「the existing and forecast demand」とする。

- *22 - P. 6 III. 3. (1). (b)の中で「the Project incorporated with the Sarawak Electricity Supply Corporation (hereinafter referred to as "SESCO")'s generation and transmission lines expansion plan」を「the selected projects taking into account of the SESCO's generation and transmission lines expansion plan」とする。
- *23 - P. 6 III. 3. (2) を、内容、逐条書きあげ、「(i) Diversion works, (iii) All hydraulics, steel structures, (v) Infrastructure works」として新たに記す。
- *24 - P. 6 III. 3. (3) の「the project」を「the various components of the selected project(s)」とする。
- *25 - P. 6 III. 3. (4) の Construction plan for Implementation of the Project について、表題の「the Project」を「the Selected Project(s)」とする。また内容をブレイクダウンして記す。
- *26 - P. 7 V. 1. (4) の30部を50部、1. (5) の50部を100部とする。
- *27 - P. 12~14 Appendix II の日本側 undertaking 中 2.1.4, 2.2.4, 3.1.4, 3.2.5, 3.4.5, 4.2 の各項にある「together with SESCO counterparts」を削除し、また「Undertakings by the Government of Japan」を「Undertakings by the Government of Japan together with SESCO counterparts」とかえる。
- *28 - P. 12 Appendix II の「マ」側 undertaking 中、2. 1. 2. (5) の「1:5000 for the Project site」を「1:10,000 for the Project site」に、また「1:1000 ~ 1:2000 for the dam site」を「1:5000 for the dam site」にかえる。
- *29 - P. 12 Appendix II の「マ」側 undertaking 中、2. 2. 4 の「1:500 for the dam site」を「1:1000 for the dam site」とする。
- *30 - P. 14 Appendix II の日本側 undertaking 中、4. 2. の後に「3. Provision of hydrological measuring instruments」を加える。

以上*9~*30のそれぞれについて24日午後日本側では検討を行い、それぞれについての対処方針を考慮しつつ、25日のステアリングコミッティにおいて日本側案を協議のベースとするよう交渉することとした。

10/25, SESCOにて9:30より「マ」側12名（Chairman, EPUインフラ課長、他EPU, 連邦エネルギー省, Sarawak State Planning Unit, サラワクインフラ開発省, SESCOより11名）、日本側6名（事前調査団5名及び、JICAクアラルンプール事務所岩佐次長）が参加して、ステアリングコミッティが開かれた。

会議は、冒頭日本側から「日本側案をベースとして会議を進めたい」旨述べたが「マ」側

は「SESCOが作成したカウンター案に基づきとりすすめる」旨述べ、「この会議において出た意見を日本側が持帰り検討されたい」旨述べた。

続いて協議はカウンター案の一条一項ごとに検討を加えることとなった。

その際以下に述べる協議が行われた。

以下*31～*43は、SESCO作成カウンター案S/Wに付けられている。

*31 - EPUより 1. 2行目「implement」を「conduct」とする。

*32 - わが方より II. OBJECTIVE OF THE STUDY の最終パラグラフについて「調査はコンサルがやるのではなく JICA が任命したコンサルが行い、その調査内容については JICA が責任を負うものである。またコンサル選定に際し、P,Q を求めるが如きことを「マ」側はなし得ない。また融資に耐える調査をするのは当然のことである。それ故、S/Wからは落とされたい」と発言し、「マ」側も了解した。

*33 - わが方より III. 1. (a)と(b)の間で「“Comparative layout study” を抜いた理由は何か？」と問うたところ「マ」側より「日本案のとおり入れることとしたい」と回答があった。

*34 - III. 1. (d),(i)のサイト選定方法に関し、日本側より「選定は“マ”側のみで行なうのか？」と質し、「in consultation with JICA」を入れることで了解を得た。

*35 - III. 2. FIELD INVESTIGATION STAGE の前文中の「but not necessarily limited to」について、日本側より「通常このような表現は Consultation の項で検討すべきこととして、入れない」旨述べ「マ」側(EPU)も了解した。

*36 - III. 3. FEASIBILITY DESIGN STAGE の前文中の「the initial results」について、日本側より「これはどういう意味か？ 初期段階以外の結果もこの STAGE の調査に含まれるのでないか？」と述べたところ、「マ」側は了解し、「initial」を削除した。

*37 - III. 3. FEASIBILITY DESIGN STAGE の前文中の「but not necessarily limited to」を*35 -と同様削除する。

*38 - V.(d)及び(e)の部数について日本側より「部数が他の案件と較べ多すぎる」旨述べたところ EPUからも同様の考えが示され、結局「(d)は30部、(e)は80部」とする折衷された数字が出た。

*39 - VII. 1. (iv)(v)に関し、EPUより「SESCOはヘリコプター経費を負担する意向ありや？」と問い合せが出、SESCOはEPUに対し「他案件ではどうなっているか」と逆の問い合せが出た。これに対しESPは「ケースバイケース」と述べたところSESCOは「ではJICA負担とされたい」と述べた。これに対し、日本側は本格調査で概

ね30時間が必要とみられるところ、「30時間までSESCO負担、それ以上日本側負担とする」よう述べた。

*40－ Ⅷの(a)～(c)の他に、EPUより「日本が調査旅費を負担すること」、「C/Pの受入れを考慮すること」を入れるよう意見が出た。これについて日本側は「前者はこれまでも負担しており当然のことである、後者はM/Mに記載したい」と述べたが、「マ」側は自らの意見を譲らなかった。

*41－ Appendix IIの「マ」側undertaking 2.1.2.(5)の中で日本側は「1:10,000」の地図縮尺は小水力計画には小縮尺すぎる」旨説明し「1:5000」にするよう求め、「マ」側の了解を得た。

*42－ Appendix IIの「マ」側undertaking 2.2.4.の中で「1:1000」とあるものも*41と同じ理由で「1:500」とするよう日本側は説明し、了解を得た。

*43－ Appendix IIの「マ」側undertaking 4.3.について日本側より「これは機材供与を意味するのか？」と問うたところ「YES」の答えがあった。そこで日本側より「機材供与についてはM/Mに入れて処理している」旨説明し、了解を得た。

以上の協議を踏まえた上、10/25午後よりEPU及びSESCOとの間でM/M(3.(4)参照)の作成を行い、同日夜、EPUインフラ課長とJICA調査団長との間で署名を行った。

M/Mの主な内容は「マ」側のカウンター等の中で中心をなす箇所、S/W署名可能な時期、JICAがチーム派遣可能な時期、5万地形図の入手」となっている。

(2) 日本側オリジナルS/W案

以下、マレーシアへ出発する前に、日本国内において作成したS/W案を掲げる。なおS/W案文中の*1～30は、「マ」側からコメントの出た部分を示す。

SCOPE OF WORK
FOR
THE FEASIBILITY STUDY
*9
ON SARAWAK SMALL SCALE HYDROELECTRIC POWER DEVELOPMENT PROJECT
IN MALAYSIA

AGREED UPON BETWEEN
THE GOVERNMENT OF MALAYSIA
AND
THE JAPAN INTERNATIONAL COOPERATION AGENCY

KUALA LUMPUR

OCTOBER 1985

DIRECTOR GENERAL,
ECONOMIC PLANNING UNIT,
PRIME MINISTER'S DEPARTMENT,
on behalf of
THE GOVERNMENT OF MALAYSIA

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I. INTRODUCTION

In response to the request of the Government of Malaysia, the Government of Japan has decided to implement the Feasibility Study ^{*10} (hereinafter referred to as "the Study") ^{*11} on Sarawak Small Scale Hydroelectric Power Development Project (hereinafter referred to as "the Project"), and in accordance with the relevant laws and regulations in force in Japan, 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 of Malaysia.

The present document sets forth the Scope of Work with regard to the Study.

II. OBJECTIVE OF THE STUDY

^{*12} The objective of the Study is to formulate the optimum project plan and assess technical, economic and financial feasibility of the Project.

III. SCOPE OF THE STUDY

The Study consists of the following three(3) stages:

1. Identification Stage
2. Field Investigation Stage
3. Feasibility Design Stage

The detailed scope of work at the respective stages are itemized as follows:

1. Identification Stage

- (1) Investigation into social, economic and financial background and power situation

Investigations and data collection concerning social, economic and financial conditions and the existing power facilities, load forecast, power source development programs.

- *13
(2) Comparative layout studies

*1
Comparative studies of the previous development plans, based upon the existing topographic maps and relevant data.

- (3) Site reconnaissance

(a) Site reconnaissance in the vicinities of Sri Aman, Limbang, Sarikei and Kapit.

*2
(b) Ground surface surveys on topography and geology of probable dam sites including reservoir areas, power station sites, switchyards and quarry sites.

(c) Surveys on a transportation program

- *14
(4) Selection of the optimum site(s) and preparation of a field investigation program

(a) Selection of the site(s)

*15
Preliminary layout studies of several alternative sites will be conducted. Then, construction costs of the respective sites will be estimated on the basis of preliminary layout design, and costs and benefits will be examined. The optimum site(s) to supply power to Sri Aman, Limbang, Sarikei and Kapit will be selected among the alternative sites from the technical, economic, social and environmental viewpoints.

(b) Preparation of a field investigation program

The program of the field investigation works on the optimum site(s) will be prepared.

The field investigation works will include topographic surveys, seismic prospecting, drilling works and field/laboratory tests.

(5) Site confirmation

Following conditions shall be satisfied with a view to proceed to the Field Investigation Stage and Feasibility Design Stage.

*16 (a) Identification of more than one (1) optimum site which will *3 meet the required installed capacity of "a few MW".

*17 (b) Signing of Minutes of Meeting between JICA and the Government of Malaysia which will include the name(s) of the optimum site(s) (hereinafter referred to as "the selected sites"), and a tentative time schedule of the Field Investigation Stage.

2. Field Investigation Stage

Based upon the results of studies at the Identification Stage, *18 the following will be carried out.

(1) Topographic survey

Ground survey on the selected sites of dam, spillway, headrace, power station, tailrace, switchyard and quarry, including the installation of survey posts and bench marks.

Aerophotograph mapping will be also conducted if so found necessary at the Identification Stage.

(2) Geological and material survey

(a) Seismic prospecting

Seismic prospecting on the selected sites of dam, spillway, headrace, power station and quarry.

(b) Drilling works

Drilling works and permeability tests on the selected sites of dam, spillway, headrace, power station, tailrace and quarry.

(c) Trench excavation

Geological investigation by trench excavation and collection of soil and/or rock materials on the selected sites of dam, spillway and quarry.

(d) Test pitting

Collection of investigation materials by test pitting on the selected sites of concrete aggregates, quarry if necessary and river-bed materials.

(e) Field/laboratory tests

Mechanical tests of fill materials, soil tests, concrete aggregate tests, bed-rock mechanical tests and water quality tests.

(3) Hydrological survey

(a) Siting of hydrological observation stations (rainfall gauging stations, water level gauging stations and discharge observation stations).

(b) Actual measurement of discharge, sediment at the installed discharge observation stations.

- (c) Hydro-meteorological study on flood/drought run-off and sediment.
- (4) Power market survey
 - ^{*19}(a) Review and analysis of the present power system and relevant future program.
 - ^{*19}(b) Collection of information on a relevant future program of industrialization.
 - ^{*19}(c) Review and analysis of relevant information on growth of power consumption, available forecasts of power demand, characteristics of power consumption pattern, etc..
- (5) Investigation and study of substations and transmission lines from power stations to the closest substation proposed.
- (6) Study of social and environmental problems.
- (7) Investigation of access road and transportation.
- (8) Investigation of the houses, roads, land and rights to be submerged in the reservoir, and recommendation on compensation thereof.

3. Feasibility Design Stage

Based upon the results of studies at the Field Investigation Stage
^{*20}the following will be carried out.

- (1) Study and review of a power generating scheme
 - (a) Study and review of a power generating scheme and study of optimum operation of the power stations for the demand.
^{*21}

- (b) To ascertain the timing, staging and phasing of the development of the Project^{*22} incorporated with the Sarawak Electricity Supply Corporation (hereinafter referred to as "SESCO")'s generation and transmission lines expansion plan.
- (2) Feasibility design^{*23}
The design work will include principal structures of civil works, steel structures, electro-mechanical equipments, temporary construction facilities, transmission line routes and transmission line structures.
- (3) Cost estimation^{*24}
The cost estimation of the Project will be broken down into local and foreign currency costs. The schedule of yearly disbursement will be prepared.
- (4) Construction plan for implementation of the Project^{*25}
The construction plan for the Project will be prepared using bar chart.
- (5) Economic and financial analysis of the Project
Economic analysis will be carried out for power generation. The economic analysis will include computation of the capital cost and operation and maintenance costs, examination and economic analysis of alternative power sources, project analysis from the viewpoint of national economy, cost-benefit analysis, calculation of economic rate of return and sensitivity analysis.
Financial analysis will include determination of financial capital costs, cash flow, evaluation of financial internal rate of return.

*4

IV STUDY SCHEDULE

The whole work will be conducted in accordance with the tentative time schedule as shown in Appendix I.

V REPORTS

1. The Government of Japan will prepare and submit the following reports in English to the Government of Malaysia.

(1) Inception Report

30 copies.

(2) Progress Report

30 copies.

(3) Technical Specifications

30 copies.

(4) Draft Final Report

*26

30 copies.

(5) Final Report

*26

50 copies

2. The Study team should ensure that all data, information, maps, materials and findings connected with the Study are kept confidential and not disposed of or revealed to any third party except with prior written consent of the Government of Malaysia. Such maps and aerial photographs are to be returned to the Government of Malaysia immediately upon completion of the Study. All reports when finalized and submitted to the Government of Malaysia shall remain the property of the Government of Malaysia.

VI TECHNICAL UNDERTAKINGS

The division of technical undertakings by the Government of Japan and the Government of Malaysia is detailed in Appendix II.

VII UNDERTAKINGS OF THE GOVERNMENT OF MALAYSIA

1. To facilitate the smooth conduct of the Study, the Government of Malaysia shall take the following necessary measures:

- (1) To inform the members of the Japanese Study team of any existing risk in the Study area and to take any measures deemed necessary to secure the safety of the Study team.
- (2) To secure the necessary entry permits for the Japanese Study team to conduct field surveys in Malaysia and exempt them from consular fees.
- (3) To exempt the members of the Japanese Study team from taxes and duties, as normally accorded under the provision of Malaysian General Circular No.1 of 1979, on equipment, machinery and other materials brought into and out of Malaysia for the conduct of the Study.
- (4) To exempt the members of the Japanese Study team from Malaysian income tax on his official emoluments in respect of their period of assignment in Malaysia in connection with the conduct of the Study but the Government of Malaysia shall retain the right to take such emoluments into account for the purpose of assessing the amount to be applied to income from other sources.
- (5) To provide the necessary facilities to the Japanese Study team for remittance as well as utilization of funds introduced into Malaysia from Japan in connection with the implementation of the Study.
- (6) To secure permission for entry into private properties or restricted areas for the conduct of the Study.
- (7) To provide the Japanese Study team with medical services when needed but the expenses will be chargeable to the members of the Japanese Study team.

- (8) To make arrangements for the Study team to take back to Japan the data, maps and materials connected with the Study, subject to the approval of the Government of Malaysia in order to prepare the reports.
- (9) To facilitate prompt clearance through customs and inland transportation where possible, of equipment, materials and supplies required for the Study.
- (10) To indemnify any member of the Japanese Study team in respect of damages arising from any legal action against him in relation to any act performed or omissions made in undertaking the Study except when the two Governments agree that such a member is guilty of gross negligence or wilful misconduct.
- (11) To nominate SESCO to act as counterpart agency to the Japanese Study team and the Economic Planning Unit as the main coordinating body in relation with other governmental and non-governmental organizations concerned.
- (12) At its own expense to provide the Japanese Study team with the following.
 - (a) Available relevant data and information relating to the Study.
 - (b) Counterpart personnel to the Study team during the Study period.
 - (c) Suitable office space with necessary office equipment both in Kuching and in the vicinity of the Study site.
 - (d) Credentials or identification cards.
 - (e) Adequate means of local transport for official travel only.
 - (f) Any other necessary communication facilities during the course of the Study, such as telephone, telex, transceivers etc..
 - (g) Clearing of paths for execution of field survey, geological survey and drilling work on the Project area.

(h) Necessary labor for the Study.

VII UNDERTAKINGS OF THE GOVERNMENT OF JAPAN

In order to conduct the Study, the Government of Japan shall take the following measures.





- (1) To despatch, at its own expense, Study teams to undertake the Study in Malaysia.
- (2) To meet the cost of accomodation and housing expenses for the Japanese Study team during their period of assignment in Malaysia.
- (3) To perform technology transfer to the Malaysian counterpart personnel in the course of the Study.


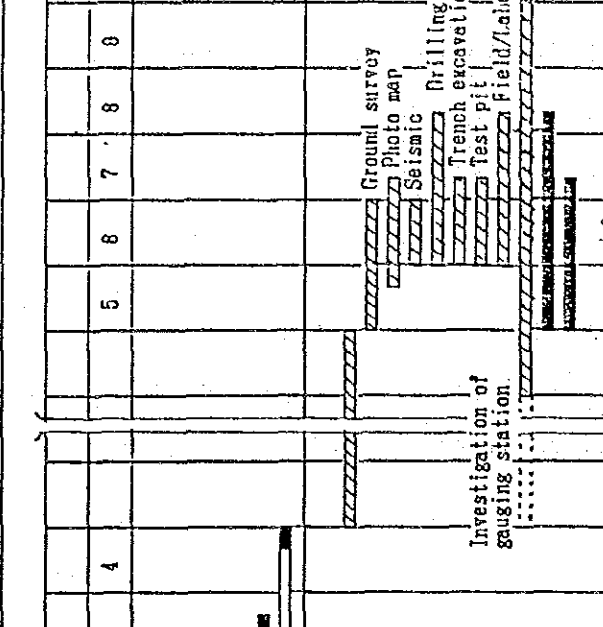
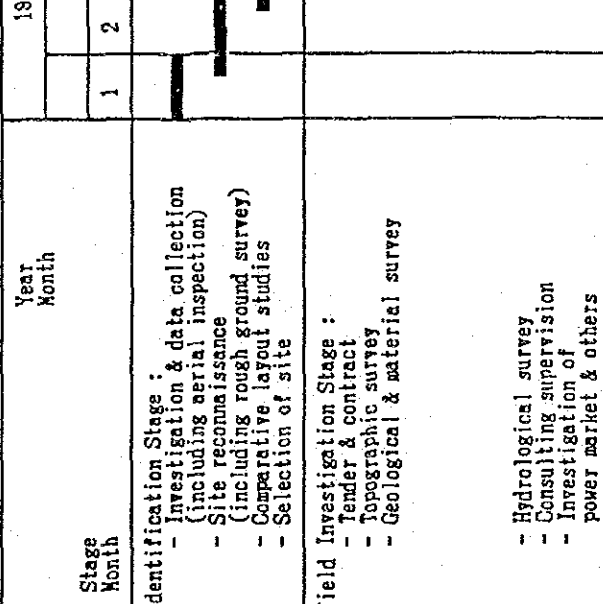
*5

IX CONSULTATION

The Government of Japan and the Government of Malaysia shall consult with each other in respect of any matter that is not agreed upon in this document and may arise from or in connection with the Study.

Appendix I : Tentative Time Schedule for Feasibility Study of Sarawak Small Scale Hydroelectric Power Development Project

 Undertaking by M'sia
  Undertaking by Japan
  Undertaking by Japan (Work in M'sia)
  Undertaking by Japan (Work in Japan)

Stage Month	1988															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Identification Stage : - Investigation & data collection (including aerial inspection) - Site reconnaissance (including rough ground survey) - Comparative layout studies - Selection of site																
Field Investigation Stage : - Tender & contract - Topographic survey - Geological & material survey - Hydrological survey - Consulting supervision - Investigation of power market & others																
Feasibility Design Stage Report - Inception Report - Progress Report *7 - Interim Report and Technical Specification - Draft Final Report - Final Report																

Appendix II Technical Undertakings by the Government of Japan and the Government of Malaysia
for Feasibility Study of Sarawak Small Scale Hydroelectric Power Development Project

Working Items	Undertakings by the Government of Japan	Undertakings by the Government of Malaysia
<p>1. Site reconnaissance</p> <p>2. Topographic survey</p> <p>2.1. Aerial survey and mapping</p>	<p>1. Site reconnaissance</p> <p>1. Programming</p> <p>2. Preparation of specifications</p> <p>3. Check and decision of control points</p> <p>4. Supervision of aerial topographic survey^{*28} together with SESCO counterparts</p>	<p>1. Provision of counterpart engineers and laborers for guidance, clearing of paths, and transport facilities</p> <p>1. Provision of assistants and laborers for aerographic survey</p> <p>2. Carrying out of the following items by contracting with local contractor(s)</p> <p>(1) Survey of control points</p> <p>(2) Aero-photographing</p> <p>(3) Aerial triangulation</p> <p>(4) Provision of films/maps</p> <p>(5) Aerographic mapping on the scale of 1:500 for the project site and 1:1000 ~ 1:2000 for the dam site^{*28}</p>
<p>2.2. Ground survey</p>	<p>1. Programming</p> <p>2. Preparation of specifications</p> <p>3. Determination of locations^{*28}</p> <p>4. Supervision of ground survey together with SESCO counterparts</p> <p>5. Despatch of a ground survey advisor</p>	<p>1. Provision of assistants and laborers for ground survey</p> <p>2. Provision and ascertaining of height at the bench mark available in the nearest terminal to the site</p> <p>3. Carrying out of ground survey by contracting with local contractor(s)</p> <p>4. Production of survey maps on the scale of 1:500 for the dam site and other main structures' sites, if necessary^{*29}</p>

Working Items	Undertakings by the Government of Japan	Undertakings by the Government of Malaysia
3. Geological investigation 3.1. Drilling work and permeability tests	<ol style="list-style-type: none"> 1. Preparation of specifications 2. Selection of drilling locations 3. Geological assessment of boring cores 4. Supervision of geological investigations^{*8}^{*27} together with SESCO counterparts 5. Despatch of supervisors for drilling work and permeability tests 	<ol style="list-style-type: none"> 1. Provision of laborers and technical assistants 2. Carrying out of drilling works and permeability tests by contracting with local contractor(s)
3.2. Seismic prospecting	<ol style="list-style-type: none"> 1. Programming 2. Identification of locations of the area 3. Supervision of seismic prospecting 4. Despatch of an expert in seismic prospecting^{*8}^{*27} 5. Analysis of data together with SESCO counterparts 	<ol style="list-style-type: none"> 1. Provision of laborers for seismic prospecting 2. Carrying out of necessary topographic surveys 3. Provision of explosives for seismic prospecting 4. Provision of technical assistants and guards of powder magazine(s) 5. Provision of powder magazine(s) 6. Carrying out of recording
3.3. Trench and pit excavations	<ol style="list-style-type: none"> 1. Programming 2. Preparation of specifications 3. Determination of location 4. Supervision of trench and pit excavations 5. Geological assessment of results of trench and pit excavations 	<ol style="list-style-type: none"> 1. Carrying out of trench and pit excavation

Working Items	Undertakings by the Government of Japan	Undertakings by the Government of Malaysia
<p>3.4. Field/laboratory tests</p>	<ol style="list-style-type: none"> 1. Programming 2. Preparation of specifications 3. Identification of location for sampling 4. Despatch of an expert 5. Analysis of data^{*8} together with SESCO counterparts 	<ol style="list-style-type: none"> 1. Carrying out of the following items by contracting with local contractor(s) <ol style="list-style-type: none"> (1) Provision of laborers for sampling and local transport of sampled materials (2) Preparation of testing devices (3) Carrying out of tests
<p>3.5. Preparation of geological maps</p>	<ol style="list-style-type: none"> 1. Field reconnaissance 2. Geological assessment based on results of field geological explorations 3. Preparation of geological maps 	<ol style="list-style-type: none"> 1. Provision of the existing available data on geology and the past earthquake in the vicinity of the Study area
<p>4. Hydrological investigation (including water quality and sedimentation, flood and drought studies)</p>	<ol style="list-style-type: none"> 1. Planning of hydrological measurement 2. Analysis of data together with SESCO counterparts <p style="text-align: center;">*30</p>	<ol style="list-style-type: none"> 1. Provision of available hydrological data 2. Installation of measuring instruments 3. Observation and recording 4. Provision of laborers for sediment sampling
<p>5. Load demand and transmission studies</p>	<ol style="list-style-type: none"> 1. Review and analysis of previous studies 2. Preparation of demand forecast and Power development program 	<ol style="list-style-type: none"> 1. Provision of previous studies on potential load demand and transmission requirement
<p>6. Land use, social and environmental surveys</p>	<ol style="list-style-type: none"> 1. Carrying out of surveys 	<ol style="list-style-type: none"> 1. Provision of relevant data 2. Provision of assistants and laborers for surveys

(3) マレーシア側カウンターS/W案

以上、SESCOが作成したカウンターS/W条を掲げる。なおカウンターS/W案文中の
*31～43は、10月25日のステアリングコミッティにおいて議論の出た部分である。

SCOPE OF WORK
FOR
THE FEASIBILITY STUDY
OF SMALL SCALE HYDROELECTRIC POWER PROJECTS
IN SARAWAK, MALAYSIA

AGREED UPON BETWEEN
THE GOVERNMENT OF MALAYSIA
AND
THE JAPAN INTERNATIONAL COOPERATION AGENCY

I INTRODUCTION

In response to the request of the Government of Malaysia, the Government of Japan has decided to^{*31} implement the Feasibility Study on small scale Hydroelectric Power Projects in Sarawak (hereinafter referred to as "the Study"), and in accordance with the relevant laws and regulations in force in Japan, 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 of Malaysia.

The present document sets forth the Scope of Work with regard to the Study.

II. OBJECTIVE OF THE STUDY

The objective of the Study is to formulate the optimum development plan for small scale hydroelectric power projects to supply power to the following regional load centres:

- (a) Sri Aman
- (b) Sarikei
- (c) Limbang
- (d) Kapit

and assess the technical, economic and financial viability and feasibility of these projects, taking into account, among other factors, the pattern of derived long term streamflow series, the predicted future power and energy requirements up till the year 2010 and the economics of alternative generation methods.

^{*32} The study should preferably be undertaken by consultants with specialized experience acquired from similar studies overseas or locally, and should be fully acquainted with guidelines laid down by international funding agencies for appraising such study.

III. SCOPE OF THE STUDY

The Study consists of the following three (3) stages:

1. Identification Stage
2. Field Investigation Stage
3. Feasibility Design Stage

The detailed scope of work at the respective stages are itemized as follows:

1. IDENTIFICATION STAGE

(a) Investigation into Social, Economic and Financial Background and Power Station

Investigations and data collection concerning social, economic and financial conditions and the existing power facilities, load forecast and power source development programs.

*33.

(b) Site Reconnaissance

(i) Site reconnaissance in the vicinities of Sri Aman, Limbang, Sarikei and Kapit.

(ii) Ground surface surveys on topography and geology of probable dam sites including reservoir areas, power station sites, switchyards and quarry sites.

(iii) Surveys on a transportation program.

(iv) Preliminary hydrological study

(c) Selection of the Optimum Site(s) and Preparation of a Field Investigation Program

(i) Selection of the Site(s)

Preliminary layout studies of several potential sites will be conducted. Based on these studies, preliminary layout designs shall be prepared which shall include determination of the power capacity, recommendations concerning key dimensions, size and type of all structures, the nos. of generating units, the main characteristics of the electrical and mechanical plant, including the transmission system. Then, construction costs of the respective sites will be estimated on the basis of these preliminary layout design, and costs and benefits will be examined. Selection of one optimum site, among the potential sites, which will meet the existing and forecasted load demand for each of the four selected areas viz. Sri Aman, Limbang, Sarikei and Kapit.

(ii) Preparation of a Field Investigation Program

The program of the field investigation works on the optimum site(s) will be prepared.

The field investigation works will include topographic surveys, seismic prospecting, drilling works and field/laboratory tests.

(d) Site Confirmation:

Following conditions shall be satisfied with a view to proceed to the Field Investigation Stage and Feasibility Design Stage.

- *34
- (i) The Sarawak Electricity Supply Corporation (hereafter referred to as "SESCO") as the implementing body shall then identify the best site(s) hereafter referred to as the "selected site(s)" out of these optimum sites for the next stage of the study.

- (ii) Signing of Minutes of Meeting between JICA and the Government of Malaysia which will include the name(s) of the selected site(s) and a tentative time schedule of the Field Investigation Stage.

2. FIELD INVESTIGATION STAGE

Based upon the results of studies at the Identification Stage, the subsequent works will include, ^{*38} but not necessarily limited to, the followings:

(a) Topographic Survey

Ground survey on the selected sites of dam, spillway, headrace, power station, tailrace, switchyard and quarry, including the installation of survey posts and bench marks.

Aerophotograph mapping will be also conducted if so found necessary at the Identification Stage.

(b) Geological and Material Survey

(i) Seismic Prospecting

Seismic prospecting on the selected sites of dam, spillway, headrace, power station and quarry.

(ii) Drilling Works

Drilling works and permeability tests on the selected sites of dam, spillway, headrace, power station, tailrace and quarry.

(iii) Trench Excavation

Geological investigation by trench excavation and collection of soil and/or rock materials on the selected sites of dam, spillway and quarry.

(iv) Test Pitting

Collection of investigation materials by test pitting on the selected sites of concrete aggregates, quarry if necessary and river-bed materials.

(v) Field/Laboratory Tests

Mechanical tests of fill materials, soil tests, concrete aggregate tests, bed-rock mechanical tests and water quality tests.

(c) Hydrological Survey

(i) Siting of hydrological observation stations (rainfall gauging stations, water level gauging stations and discharge observation stations).

(ii) Actual measurement of discharge, sediment at the installed discharge observation stations.

(iii) Hydro-meteorological study on flood/drought, run-off and sediment.

(d) Power Market Survey

All the available power and energy demand forecasts would be reviewed and on the basis of available data relating to population growth and development proposals load forecasts up to the year 2010 would be projected.

A planting programme for the selected project(s) to meet the demand would be formulated taking into consideration. All other proposed power developments for the period.

- (e) Investigation and study of substations and transmission lines from power stations to the closest substation proposed.
- (f) Study of social and environmental problems.
- (g) Investigation of access road and transportation.
- (h) Investigation of the houses, roads, land and rights to be submerged in the reservoir, and recommendation and compensation thereof.

3. FEASIBILITY DESIGN STAGE

Based upon the ^{*36}initial results of the studies at the Field Investigation Stage, the subsequent works will include, ^{*37}but not necessarily limited to, the following:-

(a) Study and Review of a Power Generating Scheme

- (i) Study and review of a power generating scheme and study of optimum operation of the power stations for the existing and forecasted demand.
- (ii) To ascertain the timing, staging and phasing of the development of the selected projects taking into account of the SESCO's generation and transmission lines expansion plan.

(b) Feasibility Design

The design work shall include the following:-

- (i) Diversion works;
- (ii) All principal structures of civil works such as dam, power station and appurtenant works;
- (iii) All hydraulics, steel structures;
- (iv) Electro-mechanical equipments;
- (v) Infrastructure works;
- (vi) Temporary construction facilities;
- (vii) Transmission line routes; and
- (viii) Transmission line structures.

(c) Cost Estimation

The cost estimation of the various components of the selected project(s) will be broken down into local and foreign currency costs. The schedule of yearly disbursement will be prepared.

(d) Construction Plan for Implementation of the Selected Project(s)

Preliminary design and construction works schedule would be prepared for the various stages of implementation of the project up to the date of commercial operation of the generating plants. The schedule would detail all phases of construction planning including detailed site investigation, and design and preparation of tendering documents to cover a contract for the civil works, an electrical and mechanical contract and a transmission lines contract.

(e) Economic and Financial Analysis of the Project

Economic analysis will be carried out for power generation. The economic analysis will include computation of the capital cost and operation and maintenance costs, examination and economic analysis of alternative power sources, project analysis from the viewpoint of national economy, cost-benefit analysis, calculation of economic rate of return and sensitivity analysis.

Financial analysis will include determination of financial capital costs, cash flow, evaluation of financial internal rate of return.

IV STUDY SCHEDULE

The whole work will be conducted in accordance with the tentative time schedule as shown in Appendix I.

V REPORTS

1. The Government of Japan will prepare and submit the following reports in English to the Government of Malaysia.

(a) Inception Report.

30 copies.

(b) Monthly Progress Report

30 copies.

(c) Technical Specifications

30 copies

(d) Draft Final Report

*36
50 copies

(e) Final Report

*38
100 copies

2. The Study team should ensure that all data, information, maps, materials and findings connected with the Study are kept confidential and not disposed of or revealed to any third party except with prior written consent of the Government of Malaysia. Such maps and aerial photographs are to be returned to the Government of Malaysia immediately upon completion of the Study. All reports when finalized and submitted to the Government of Malaysia shall remain the property of the Government of Malaysia.

VI TECHNICAL UNDERTAKINGS

The division of technical undertakings by the Government of Japan and the Government of Malaysia is detailed in Appendix II.

VII UNDERTAKINGS OF THE GOVERNMENT OF MALAYSIA

1. To facilitate the smooth conduct of the Study, the Government of Malaysia shall take the following necessary measures:
 - (a) To inform the members of the Japanese Study team of any existing risk in the Study area and to take any measures deemed necessary to secure the safety of the Study team.
 - (b) To secure the necessary entry permits for the Japanese Study team to conduct field surveys in Malaysia and exempt them from consular fees.
 - (c) To exempt the members of the Japanese Study team from taxes and duties, as normally accorded under the provision of Malaysian General Circular No. 1 of 1979, on equipment, machinery and other materials brought into and out of Malaysia for the conduct of the Study.
 - (d) To exempt the members of the Japanese Study team from Malaysian income tax on his official emoluments in respect of their period of assignment in Malaysia in connection with the conduct of the Study but the Government of Malaysia shall retain the right to take such emoluments into account for the purpose of assessing the amount to be applied to income from other sources.
 - (e) To provide the necessary facilities to the Japanese Study team for remittance as well as utilization of funds introduced into Malaysia from Japan in connection with the implementation of the Study.
 - (f) To secure permission for entry into private properties or restricted areas for the conduct of the Study.
 - (g) To provide the Japanese Study team with medical services when needed but the expenses will be chargeable to the members of the Japanese Study team.
 - (i) To make arrangements for the Study team to take back to Japan the data, maps and materials connected with the Study, subject to the approval of the Government of Malaysia in order to prepare the reports.
 - (j) To facilitate prompt clearance through customs and inland transportation where possible, of equipment, materials and supplies required for the Study.

- (k) To indemnify any member of the Japanese Study team in respect of damages arising from any legal action against him in relation to any act performed or omissions made in undertaking the Study except when the two Governments agree that such a member is guilty of gross negligence or wilful misconduct.
- (l) To nominate SEESCO to act as counterpart agency to the Japanese Study team and the Economic Planning Unit as the main coordinating body in relation with other governmental and non-governmental organizations concerned.
- (m) At its own expense to provide the Japanese Study team with the following.
 - (i) Available relevant data and information relating to the Study.
 - (ii) Counterpart personnel to the Study team during the Study period.
 - (iii) Suitable office space with necessary office equipment both in Kuching and in the vicinity of the Study site.
 - (iv) Credentials or identification cards.
 - (v) ^{*39} Adequate means of local transport for official travel only.
 - (vi) Any other necessary communication facilities during the course of the Study, such as telephone, telex, transceivers etc.
 - (vii) Clearing of paths for execution of field survey, geological survey and drilling work on the Project area.
 - (viii) Necessary labor for the Study.

VIII UNDERTAKINGS OF THE GOVERNMENT OF JAPAN

In order to conduct the Study, the Government of Japan shall take the following measures.

- (a) To despatch, at its own expense, Study teams to undertake the Study in Malaysia.
- (b) To meet the cost of accommodation and housing expenses for the Japanese Study team during their period of assignment in Malaysia.
- (c) To perform technology transfer to the Malaysian counterpart personnel in the course of the Study.

*40

IX. CONSULTATION

The Government of Japan and the Government of Malaysia shall consult with each other in respect of any matter that is not agreed upon in this document and may arise from or in connection with the Study.

Appendix II

Technical Undertakings by the Government of Japan, and the Government of Malaysia for Feasibility Study of Sarawak Small Scale Hydroelectric Power Development Project

Working Items	Undertakings by the Government of Japan together with SESCO counterparts	Undertakings by the Government of Malaysia
<p>1. Site reconnaissance</p> <p>2. Topographic survey and mapping</p> <p>2.1. Aerial survey and mapping</p> <p>2.2. Ground survey</p>	<p>1. Site reconnaissance</p> <p>1. Programming</p> <p>2. Preparation of specifications</p> <p>3. Check and decision of control points</p> <p>4. Supervision of aerial topographic survey</p> <p>1. Programming</p> <p>2. Preparation of specifications</p> <p>3. Determination of locations</p> <p>4. Supervision of ground survey</p> <p>5. Despatch of a ground survey advisor</p>	<p>1. Provision of counterpart engineers and laborers for guidance, clearing of paths, and transport facilities</p> <p>1. Provision of assistants and laborers for aerographic survey</p> <p>2. Carrying out of the following items by contracting with local contractor(s)</p> <p>(1) Survey of control points</p> <p>(2) Aero-photographing</p> <p>(3) Aerial triangulation</p> <p>(4) Provision of films/maps</p> <p>(5) Aerographic mapping on the scale of $\frac{1}{40000}$ for the project site and $\frac{1}{5000}$ for the dam site</p> <p>1. Provision of assistants and laborers for ground survey</p> <p>2. Provision and ascertaining of height at the bench mark available in the nearest terminal to the site</p> <p>3. Carrying out of ground survey by contracting with local contractor(s)</p> <p>4. Production of survey maps on the scale of $\frac{1}{40000}$ for the dam site and other main structures' sites, if necessary</p>

Working Items	Undertakings by the Government of Japan together with SESCO counterparts	Undertakings by the Government of Malaysia
<p>3. Geological investigation</p> <p>3.1. Drilling work and permeability tests</p> <p>3.2. Seismic prospecting</p>	<ol style="list-style-type: none"> 1. Preparation of specifications 2. Selection of drilling locations 3. Geological assessment of boring cores 4. Supervision of geological investigations 5. Despatch of supervisors for drilling work and permeability tests 1. Programming 2. Identification of locations of the area 3. Supervision of seismic prospecting 4. Despatch of an expert in seismic prospecting 5. Analysis of data 	<ol style="list-style-type: none"> 1. Provision of laborers and technical assistants 2. Carrying out of drilling works and permeability tests by contracting with local contractor(s)
<p>3.3. Trench and pit excavations</p>	<ol style="list-style-type: none"> 1. Programming 2. Preparation of specifications 3. Determination of location 4. Supervision of trench and pit excavations 5. Geological assessment of results of trench and pit excavations 	<ol style="list-style-type: none"> 1. Provision of laborers for seismic prospecting 2. Carrying out of necessary topographic surveys 3. Provision of explosives for seismic prospecting 4. Provision of technical assistants and guards of powder magazine(s) 5. Provision of powder magazine(s) 6. Carrying out of recording 1. Carrying out of trench and pit excavation

Working Items	Undertakings by the Government of Japan together with SESCO counterparts	Undertakings by the Government of Malaysia
3.4. Field/laboratory tests	<ol style="list-style-type: none"> 1. Programming 2. Preparation of specifications 3. Identification of location for sampling 4. Despatch of an expert 5. Analysis of data 	<ol style="list-style-type: none"> 1. Carrying out of the following items by contracting with local contractor(s) <ol style="list-style-type: none"> (1) Provision of labourers for sampling and local transport of sampled materials (2) Preparation of testing devices (3) Carrying out of tests
3.5. Preparation of geological maps	<ol style="list-style-type: none"> 1. Field reconnaissance 2. Geological assessment based on results of field geological explorations 3. Preparation of geological maps 	<ol style="list-style-type: none"> 1. Provision of the existing available data on geology and the past earthquake in the vicinity of the Study area
4. Hydrological investigation (including water quality and sedimentation, flood and drought studies)	<ol style="list-style-type: none"> 1. Planning of hydrological measurement 2. Analysis of data 3. Provision of hydrological measuring instruments 	<ol style="list-style-type: none"> 1. Provision of available hydrological data 2. Installation of measuring instruments 3. Observation and recording 4. Provision of labourers for sediment sampling
5. Load demand and transmission studies	<ol style="list-style-type: none"> 1. Review and analysis of previous studies 2. Preparation of demand forecast and Power development program 	<ol style="list-style-type: none"> 1. Provision of previous studies on potential load demand and transmission requirement
6. Land use, social and environmental surveys	<ol style="list-style-type: none"> 1. Carrying out of surveys 	<ol style="list-style-type: none"> 1. Provision of relevant data 2. Provision of assistants and laborers for surveys

(4) 合意したM/M

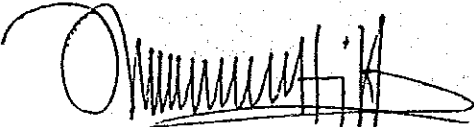
以下、10月25日ステアリング コミッティを経て合意されたM/Mを掲げる。

MINUTES OF MEETING

The JICA Preliminary Study Team for the Sarawak Small Scale Hydroelectric Power Projects visited Malaysia from 8th to 27 October 1985. The Team had a series of discussions with the Malaysian authorities concerned, namely the Economic Planning Unit of the Prime Minister's Department, the Sarawak State Planning Unit and the Sarawak Electricity Supply Corporation (SESCO). During the Steering Committee meeting held at Kuching on 25th October, both the Malaysian authorities and the JICA Team discussed the proposed Scope of Work drafted by JICA and the conclusions of the meeting are as follows:

1. Both parties agreed on the format of the Scope of Work.
2. The Malaysian party proposed that the Study be undertaken by JICA appointed consultants who have specialized experience in similar studies undertaken overseas or locally and fully acquainted with guidelines laid down by international funding agencies for appraising such studies.
3. The Malaysian party agreed in principle to the Scope of Work but would prefer to have a more detailed Scope of Work. The proposed amendments to the Scope of Work by the Malaysian party are contained in the revised Scope of Work in Attachment A which is submitted to the Government of Japan for consideration. The highlights of Attachment A are as follows:
 - (a) The Malaysian party is of the opinion that the term "a few Megawatts(MW)" is too vague and therefore should be defined by the concept "existing and forecast load demand" as indicated under sub-item 1(4) of Item III on the Scope of Work.
 - (b) The Malaysian party proposed that JICA should study several potential sites for each of the four selected areas and recommend one optimum site for each of the selected areas at the end of Identification Stage. The Malaysian Government, in consultation with JICA shall decide the best site(s) out of these optimum sites for the Field Investigation Stage and the Feasibility Design Stage.
 - (c) Under sub-item (12)(e) of Item VII on the Undertakings of the Government of Malaysia, the Malaysian party requested the Government of Japan to bear the cost of helicopter flying time for the Study.

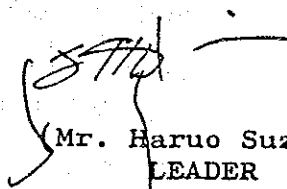
- (d) Regarding Appendix I to the Scope of Work, the Malaysian party requested that part of the work at Feasibility Design Stage should be done in Malaysia so that technology transfer to the SESCO counterpart engineers would be effectively performed. The JICA Team stated that this will be studied but a decision would be made before the signing of the Scope of Work.
4. With regard to Item 4 on Hydrological Investigation in Appendix II to the Scope of Work, the Malaysian party requested the Government of Japan to provide hydrological measuring instruments.
 5. The Malaysian party stated that the date for the signing of the Scope of Work would be communicated to the Japanese Embassy in Kuala Lumpur by the end of the year as the Malaysian allocation for the Study is yet to be approved. The JICA Team explained that JICA is ready to despatch the first field survey team by the end of Japanese Fiscal Year 1985/86 provided that the Scope of Work is signed by the end of 1985.
 6. JICA Team requested that the topographic maps required for the Study be submitted immediately upon the signing of the Scope of Work.
 7. Members of the Malaysian party and the JICA Team who attended the Steering Committee meeting are as listed in Attachment B.



(Dr. Mohd. Noor Hj. Harun)

DIRECTOR

Infrastructure and Utilities
Section, Economic Planning Unit,
Prime Minister's Department,
Malaysia



(Mr. Haruo Suzuki)

LEADER

JICA Preliminary Study
Team.

REVISED
SCOPE OF WORK
FOR
THE FEASIBILITY STUDY
OF SMALL SCALE HYDROELECTRIC POWER PROJECTS
IN SARAWAK, MALAYSIA

AGREED UPON BETWEEN
THE GOVERNMENT OF MALAYSIA
AND
THE JAPAN INTERNATIONAL COOPERATION AGENCY

I. INTRODUCTION

In response to the request of the Government of Malaysia, the Government of Japan has decided to conduct the Feasibility Study on Small Scale Hydroelectric Power Projects in Sarawak (hereinafter referred to as "the Study"), and in accordance with the relevant laws and regulations in force in Japan, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programme of the Government of Japan, will undertake the Study in close cooperation with the authorities of Malaysia.

The present document sets forth the Scope of Work with regard to the Study.

II. OBJECTIVE OF THE STUDY

The objective of the Study is to formulate the optimum development plan for small scale hydroelectric power projects to supply power to the following selected areas :

- (1) Sri Aman
- (2) Sarikei
- (3) Limbang
- (4) Kapit

and assess the technical, economic and financial viability and feasibility of these projects, taking into account, among other factors, the pattern of derived long term streamflow series, the predicted future power and energy requirements up till the year 2010 and the economics of alternative generation methods.

III. SCOPE OF THE STUDY

The Study consists of the following three (3) stages:

1. Identification Stage
2. Field Investigation Stage
3. Feasibility Design Stage

The detailed scope of work at the respective stages are itemized as follows :

1. IDENTIFICATION STAGE

- (1) Investigation into Social, Economic and Financial Background and Power Situation

Investigations and data collection concerning social, economic and financial conditions and the existing power facilities, load, forecast and power source development programmes.

(2) Comparative Layout Studies

Comparative studies of the previous development plans, based upon the existing topographic maps and relevant data.

(3) Site Reconnaissance

- (a) Site reconnaissance in the vicinities of Sri Aman, Limbang, Sarikei and Kapit.
- (b) Ground surface surveys on topography and geology of probable dam sites including reservoir areas, power station sites, switchyards and quarry sites.
- (c) Surveys on a transportation programme.
- (d) Preliminary hydrological study.

(4) Selection of the Optimum Site(s) and Preparation of a Field Investigation Programme

(a) Selection of the Site(s)

Preliminary layout studies of several potential sites will be conducted. Based on these studies, preliminary layout designs shall be prepared which include determination of the power capacity, recommendations concerning key dimensions, size and type of all structures, the numbers of generating units, the main characteristics of the electrical and mechanical plant, including the transmission system. Then, construction costs of the respective sites will be estimated on the basis of these preliminary layout design, and costs and benefits will be examined. Selection of one optimum site, among the potential sites, which will meet the existing and forecast load demand for each of the four selected areas viz. Sri Aman, Limbang, Sarikei and Kapit, shall be made.

(5) Site Confirmation

Following conditions shall be satisfied with a view to proceed to the Field Investigation Stage and Feasibility Design Stage.

(b) Preparation of a Field Investigation Programme

The programme of the field investigation works on the optimum site(s) will be prepared.

The field investigation works will include topographic surveys, seismic prospecting, drilling works and field/laboratory tests.

- (i) The Government of Malaysia shall then identify the best site(s) (hereafter referred to as the "selected site(s)") out of these optimum sites in consultation with JICA for the next stage of the Study.
- (ii) Signing of Minutes of Meeting between JICA and the Government of Malaysia which will include the name(s) of the selected site(s) and a tentative time schedule of the Field Investigation Stage.

2. FIELD INVESTIGATION STATE

Based upon the results of studies at the Identification Stage, the subsequent works will include the following :

(1) Topographic Surveys

Ground survey on the selected sites of dam, spillway, headrace, power station, tailrace, switchyard and quarry, including the installation of survey posts and bench marks.

Aerophotograph mapping will be also conducted if so found necessary at the Identification Stage.

(2) Gelological and Material Survey

(a) Seismic Prospecting

Seismic prospecting on the selected sites of dam, spillway, headrace, power station and quarry.

(b) Drilling Works

Drilling works and permeability tests on the selected sites of dam, spillway, headrace, power station, tailrace and quarry.

(c) Trench Excavation

Geological investigation by trench excavation and collection of soil and/or rock materials on the selected sites of dam, spillway and quarry.

(d) Test Pitting

Collection of investigation materials by test pitting on the selected sites of concrete aggregates, quarry if necessary and river-bed materials.

(e) Field/Laboratory Tests

Mechanical tests of fill materials, soil tests, concrete aggregate tests, bed-rock mechanical tests and water quality tests.

(3) Hydrological Survey

- (a) Siting of hydrological observation stations (rainfall gauging stations, water level gauging stations and discharge observation stations).
- (b) Actual measurement of discharge, sediments at the installed discharge observation stations.
- (c) Hydro-meteorological study on flood/drought, run-off and sediments.

(4) Power Market Survey

All the available power and energy demand forecasts would be reviewed and on the basis of available data relating to population growth and development proposals load forecasts up to the year 2010 would be projected.

A planting programme for the selected project(s) to meet the demand would be formulated taking into consideration all other proposed power developments for the period.

- (5) Investigation and study of substations and transmission lines from power stations to the closest substation proposed.
- (6) Study of social and environmental problems.
- (7) Investigation of access road and transportation.
- (8) Investigation of the houses, roads, land and rights to be submerged in the reservoir, and recommendation and compensation thereof.

3. FEASIBILITY DESIGN STAGE

Based upon the results of the studies at the Field Investigation Stage, the subsequent works will include the following:-

(1) Study and Review of a Power Generating Scheme

- (a) Study and review of a power generating scheme and study of optimum operation of the power stations for the existing and forecast demand.
- (b) To ascertain the timing, staging and phasing of the development of the selected project(s) taking into account of the Sarawak Electricity Supply Corporation's (SESCO) generation and transmission lines expansion plan.

(2) Feasibility Design

The design work shall include the following:

- (a) Diversion works;
- (b) All principal structures of civil works such as dam, power station and appurtenant works;
- (c) All hydraulics steel structures;
- (d) Electro-mechanical equipments;
- (e) Infrastructure works;
- (f) Temporary construction facilities;
- (g) Transmission line routes; and
- (h) Transmission line structures.

(3) Cost Estimation

The cost estimation of the various components of the selected project(s) will be broken down into local and foreign currency costs. The schedule of yearly disbursement will be prepared.

(4) Construction Plan for Implementation of the Selected Project(s)

Preliminary design and construction works schedule would be prepared for the various stages of implementation of the selected projects up to the date of commercial operation of the generating plants. The schedule would detail all phases of construction planning including detailed site investigation, and design and preparation of tendering documents to cover a contract for the civil works, an electrical and mechanical contract and a transmission lines contract.

(5) Economic and Financial Analysis of the Selected Project(s)

Economic analysis will be carried out for power generation. The economic analysis will include computation of the capital cost and operation and maintenance costs, examination and economic analysis of alternative power sources, project analysis from the viewpoint of national economy, cost-benefit analysis, calculation of economic rate of return and sensitivity analysis.

Financial analysis will include determination of financial capital costs, cash flow, evaluation of financial internal rate of return.

IV. STUDY SCHEDULE

The Study will be conducted in accordance with the tentative time schedule as shown in Appendix I.

V. REPORTS

1. The Government of Japan will prepare and submit the following reports in English to the Government of Malaysia:
 - (1) Inception Report
30 copies within 1 month after commencement of the Study.
 - (2) Progress Report
30 copies at the end of every other month.
 - (3) Interim Report and Technical Specifications
30 copies within 4 months after commencement of the Study.
 - (4) Draft Final Report
30 copies within ___ months after commencement of the Study.
 - (5) Final Report
80 copies within 2 month after receiving comments from the Government of Malaysia on the Draft Final Report.
2. The Study team should ensure that all data, information, maps, materials and findings connected with the Study are kept confidential and not disposed of or revealed to any third party except with prior written consent of the Government of Malaysia. Such maps and aerial photographs are to be returned to the Government of Malaysia immediately upon completion of the Study. All reports when finalized and submitted to the Government of Malaysia shall remain the property of the Government of Malaysia.

VI. TECHNICAL UNDERTAKINGS

The division of technical undertakings by the Government of Japan and the Government of Malaysia is detailed in Appendix II.

VII. UNDERTAKINGS OF THE GOVERNMENT OF MALAYSIA

1. To facilitate the smooth conduct of the Study, the Government of Malaysia shall take the following necessary measures:

- (1) To inform the members of the Japanese Study team of any existing risk in the Study area and to take any measures deemed necessary to secure the safety of the Study team.
- (2) To secure the necessary entry permits for the Japanese Study team to conduct field surveys in Malaysia and exempt them from consular fees.
- (3) To exempt the members of the Japanese Study team from taxes and duties, as normally accorded under the provision of Malaysia General Circular No. 1 of 1979, on equipment, machinery and other materials brought into Malaysia for the conduct of the Study.
- (4) To exempt the members of the Japanese Study team from Malaysian income tax on their official emoluments in respect of their period of assignment in Malaysia in connection with the conduct of the Study but the Government of Malaysia shall retain the right to take such emoluments into account for the purpose of assessing the amount to be applied to income from other sources.
- (5) To provide the necessary facilities to the Japanese Study team for remittance as well as utilization of funds introduced into Malaysia from Japan in connection with conduct of the Study.
- (6) To secure permission for entry into private properties or restricted areas for the conduct of the Study.
- (7) To provide the Japanese Study team with medical services when needed but the expenses will be chargeable to the members of the Japanese Study team.
- (8) To make arrangements for the Study team to take back to Japan the data, maps and materials connected with the Study, subject to the approval of the Government of Malaysia in order to prepare the reports.
- (9) To facilitate prompt clearance through customs and inland transportation where possible, of equipment, materials and supplies required for the Study.
- (10) To indemnify any member of the Japanese Study team in respect of damages arising from any legal action against him in relation to any act performed or omissions made in undertaking the Study except when the two Governments agree that such a member is guilty of gross negligence or wilful misconduct.
- (11) To nominate SESCO to act as counterpart agency to the Japanese Study team and the Economic Planning Unit as the main coordinating body in relation with other governmental and non-governmental organizations concerned.
- (12) At its own expense to provide the Japanese Study team with the following:

- (a) Available relevant data and information relating to the Study.
- (b) Counterpart personnel to the Study team during the Study period.
- (c) Suitable office space with necessary office equipment both in Kuching and in the vicinity of the Study site.
- (d) Credentials or identification cards.
- (e) Adequate means of local transport for official travel only.
- (f) Any other necessary communication facilities during the course of the Study, such as telephone, telex, transceivers etc.
- (g) Clearing of paths for execution of field survey, geological survey and drilling work on the Project area.
- (h) Necessary labour for the Study.

VIII. UNDERTAKINGS OF THE GOVERNMENT OF JAPAN

In order to conduct the Study, the Government of Japan shall take the following measures.

- (1) To despatch, at its own expense, Study teams in relevant fields to undertake the Study in Malaysia.
- (2) To bear travelling expenses and fares between Japan and Malaysia and within Malaysia if any, for members of the Japanese Study Team.
- (3) To meet the cost of accommodation and housing expenses for the Japanese Study team during their period of assignment in Malaysia.
- (4) To perform technology transfer to the Malaysian counterpart personnel during the course of the Study.
- (5) To give consideration to accept Malaysian counterpart personnel for training in Japan.

IX. CONSULTATION

The Government of Japan and the Government of Malaysia shall consult with each other in respect of any matter that is not agreed upon in this document and may arise from or in connection with the Study.




Appendix II Technical Undertakings by the Government of Japan and the Government of Malaysia for Feasibility Study of Sarawak Small Scale Hydroelectric Power Projects
























Working Items	Undertakings by the Government of Japan together with SESCO counterparts	Undertakings by the Government of Malaysia
<p>1. Site reconnaissance</p> <p>2. Topographic survey</p> <p>2.1 Aerial survey and mapping</p> <p>2.2 Ground survey</p>	<p>1. Site reconnaissance</p> <p>1. Programming</p> <p>2. Preparation of specifications</p> <p>3. Check and decision of control points</p> <p>4. Supervision of aerial topographic survey</p> <p>1. Programming</p> <p>2. Preparation of specifications</p> <p>3. Determination of locations</p> <p>4. Supervision of ground survey</p> <p>5. Despatch of a ground survey advisor</p>	<p>1. Provision of counterpart engineers and labourers for guidance, clearing of paths, and transport facilities</p> <p>1. Provision of assistants and labourers for aerographic survey</p> <p>2. Carrying out of the following items by contracting with local contractor(s)</p> <p>(1) Survey of control points</p> <p>(2) Aero-photographing</p> <p>(3) Aerial triangulation</p> <p>(4) Provision of films/maps</p> <p>(5) Aerographic mapping on the scale of 1:5000 for the project site and 1:5000 for the dam site</p> <p>1. Provision of assistants and labourers for ground survey</p> <p>2. Provision and ascertaining of height at the bench mark available in the nearest terminal to the site</p> <p>3. Carrying out of ground survey by contracting with local contractor(s)</p> <p>4. Production of survey maps on the scale of 1:500 for the dam site and other main structures' sites, if necessary</p>

Working Items	Undertakings by the Government of Japan together with SESCO counterparts	Undertakings by the Government of Malaysia
<p>3. Geological investigation</p> <p>3.1. Drilling work and permeability tests</p> <p>3.2. Seismic prospecting</p> <p>3.3. Trench and pit excavations</p>	<p>1. Preparation of specifications</p> <p>2. Selection of drilling locations</p> <p>3. Geological assessment of boring cores</p> <p>4. Supervision of geological investigations</p> <p>5. Despatch of supervisors for drilling work and permeability tests</p> <p>1. Programming</p> <p>2. Identification of locations of the area</p> <p>3. Supervision of seismic prospecting</p> <p>4. Despatch of an expert in seismic prospecting</p> <p>5. Analysis of data</p> <p>1. Programming</p> <p>2. Preparation of specifications</p> <p>3. Determination of location</p> <p>4. Supervision of trench and pit excavations</p> <p>5. Geological assessment of results of trench and pit excavations</p>	<p>1. Provision of laborers and technical assistants</p> <p>2. Carrying out of drilling works and permeability tests by contracting with local contractor(s)</p> <p>1. Provision of laborers for seismic prospecting</p> <p>2. Carrying out of necessary topographic surveys</p> <p>3. Provision of explosives for seismic prospecting</p> <p>4. Provision of technical assistants and guards of powder magazine(s)</p> <p>5. Provision of powder magazine(s)</p> <p>6. Carrying out of recording</p> <p>1. Carrying out of trench and pit excavation</p>

Working Items	Undertakings by the Government of Japan together with SESCO counterparts	Undertakings by the Government of Malaysia
3.4. Field/laboratory tests	<ol style="list-style-type: none"> 1. Programming 2. Preparation of specifications 3. Identification of location for sampling 4. Despatch of an expert 5. Analysis of data 	<ol style="list-style-type: none"> 1. Carrying out of the following items by contracting with local contractor(s) <ol style="list-style-type: none"> (1) Provision of labourers for sampling and local transport of sampled materials. (2) Preparation of testing devices (3) Carrying out of tests
3.5. Preparation of geological maps	<ol style="list-style-type: none"> 1. Field reconnaissance 2. Geological assessment based on results of field geological explorations 3. Preparation of geological maps 	<ol style="list-style-type: none"> 1. Provision of the existing available data on geology and the past earthquake in the vicinity of the Study area.
4. Hydrological investigation (including water quality and sedimentation, flood and drought studies)	<ol style="list-style-type: none"> 1. Planning of hydrological measurement 2. Analysis of data 	<ol style="list-style-type: none"> 1. Provision of available hydrological data 2. Installation of measuring instruments 3. Observation and recording 4. Provision of labourers for sediment sampling
5. Load demand and transmission studies	<ol style="list-style-type: none"> 1. Review and analysis of previous studies 2. Preparation of demand forecast and Power development program 	<ol style="list-style-type: none"> 1. Provision of previous studies on potential load demand and transmission requirement
6. Land use, social and environmental surveys	<ol style="list-style-type: none"> 1. Carrying out of surveys 	<ol style="list-style-type: none"> 1. Provision of relevant data 2. Provision of assistants and labourers for surveys

Appendix I : Tentative Time Schedule for Feasibility Study of Sarawak Small Scale Hydroelectric Power Development Project

 Undertaking by M'sia
  Undertaking by Japan (Work in M'sia)
  Undertaking by Japan (Work in Japan)

Stage Month	1988															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Identification Stage : - Investigation & data collection (including aerial inspection) - Site reconnaissance (including rough ground survey) - Comparative layout studies - Selection of site																
Field Investigation Stage : - Tender & contract - Topographic survey - Geological & material survey - Hydrological survey - Consulting supervision - Investigation of power market & others																
Feasibility Design Stage Report - Inception Report - Progress Report * - Interim Report and Technical Specification - Draft Final Report - Final Report																

Member ListMalaysian Steering Committee

- | | | | |
|-----|-------------------------------------|---|--|
| 1. | Dr. Mohd. Noor Hj. Harun | - | Economic Planning Unit (Chairman) |
| 2. | Ma Wong Peg Har | - | Economic Planning Unit |
| 3. | Ms Leong So Seh | - | Economic Planning Unit |
| 4. | Mr. Ahmad Latffi Hashim | - | Ministry of Energy, Telecommunications and Posts |
| 5. | Mr. Mohd. Jamil Mukmin | - | Sarawak State Planning Unit |
| 6. | Mr. Chai Sin Onn | - | Sarawak State Planning Unit |
| 7. | Mr. Haji Bujang Mohidin
Haji Jol | - | Ministry of Infrastructure Development |
| 8. | Mr. William Lai | - | SESCO |
| 9. | Mr. Ling Sik Leh | - | SESCO |
| 10. | Mr. Soon Choon Huie | - | SESCO |
| 11. | Mr. Ng Yew Tsiung | - | SESCO |
| 12. | Mr. Bernard Suling | - | SESCO |

Japanese Team

- | | | | |
|----|-----------------------|---|--|
| 1. | Mr. Haruo Suzuki | - | JICA, Tokyo (Leader) |
| 2. | Mr. Kenji Takashima | - | Ministry of International Trade and Industry |
| 3. | Mr. Osamu Shirakawa | - | Consulting Engineer |
| 4. | Mr. Toshio Shimizu | - | Consulting Engineer |
| 5. | Mr. Atsushi Kamishima | - | JICA, Tokyo |
| 6. | Mr. Mitsuo Iwasa | - | JICA, Kuala Lumpur |

(5) 日本側S/W原案とM/M中でのS/W案改訂等対比表

以下、日本側オリジナル S/W案と 60年10月25日署名された M/M にて添付されたりバイズド S/W 案の相異点对比表を掲げる。相異点は枠がこみにて示す。

(6) M/M合意後の協議

調査団は M/M 合意後以下のスケジュールにて S/W とりまとめに取り組んだ。

11月7日 - 各省会議にて現地踏査結果を報告。

14日 - 各省会議にて署名した M/M について協議。

28日 - M/M についての日本側意向を JICA クアラルンプール事務所を通じて、マレーシア側に連絡（業務公信をこの日日本から発出）。

1月 - 11月28日付業務公信に対する「マ」側の一部解答（61年1月14日付 EPU より JICA クアラルンプール事務所宛のテレックス）を入手。

2月 - 11月28日付業務公信に対する「マ」側の残り部分解答（61年2月20日付 EPU より JICA クアラルンプール事務所長あてレター）を入手。

3月13日 - 「マ」側回答についての日本側対処方針検討のための各省会議。

27日 - わが方最終案をクアラルンプール事務所長あて打電。同時に今後のスケジュール案を以下により所長の執務参考用に通報。

(1) 4月中に、貴職を通じ「マ」側から日本側最終S/W案、M/M案に対する同意取付け、あわせて現地調査工事にかかるテンドー契約に必要な期間を確認。

(2) (1)ののち本格調査実施コンサルタントの選定手続（正味2ヶ月間は必要）。

(3) (2)を経て(1)の約3ヶ月後に本格調査チームとS/W署名、事前調査団（第2次）を同時派遣。

(4) S/Wに署名したのち本格調査チームは直ちに第一次現地調査を開始。

5月6日 - EPU 書簡（Fax 信）を入手。わが方 M/M 案について若干の文言訂正が提起されているが、基本的には双方の合意し得る協力の枠組ができたと判断された。

SCOPE OF WORK
FOR
THE FEASIBILITY STUDY

ON SARAWAK SMALL SCALE HYDROELECTRIC POWER DEVELOPMENT PROJECT
IN MALAYSIA

AGREED UPON BETWEEN
THE GOVERNMENT OF MALAYSIA
AND
THE JAPAN INTERNATIONAL COOPERATION AGENCY

KUALA LUMPUR
OCTOBER 1985

DIRECTOR GENERAL,
ECONOMIC PLANNING UNIT,
PRIME MINISTER'S DEPARTMENT,
on behalf of
THE GOVERNMENT OF MALAYSIA

HARUO SUZUKI
LEADER,
PRELIMINARY STUDY TEAM,
on behalf of
THE JAPAN INTERNATIONAL
COOPERATION AGENCY

REVISED
SCOPE OF WORK
FOR

THE FEASIBILITY STUDY
OF SMALL SCALE HYDROELECTRIC POWER PROJECTS
IN SARAWAK, MALAYSIA

AGREED UPON BETWEEN
THE GOVERNMENT OF MALAYSIA
AND
THE JAPAN INTERNATIONAL COOPERATION AGENCY

I. INTRODUCTION

In response to the request of the Government of Malaysia, the Government of Japan has decided to implement the Feasibility Study (hereinafter referred to as "the Study") on Sarawak Small Scale Hydroelectric Power Development Project (hereinafter referred to as "the Project"), and in accordance with the relevant laws and regulations in force in Japan, 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 of Malaysia.

The present document sets forth the Scope of Work with regard to the Study.

II. OBJECTIVE OF THE STUDY

The objective of the Study is to formulate the optimum project plan and assess technical, economic and financial feasibility of the Project.

III. SCOPE OF THE STUDY

The Study consists of the following three (3) stages:

1. Identification Stage
2. Field Investigation Stage
3. Feasibility Design Stage

The detailed scope of work at the respective stages are itemized as follows:

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- (2) Sarikel
- (3) Limbang
- (4) Kapit

and assess the technical, economic and financial viability and feasibility of these projects, taking into account, among other factors, the pattern of derived long term streamflow series, the predicted future power and energy requirements up till the year 2010 and the economics of alternative generation methods.

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3. Feasibility Design Stage

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- (1) Investigation into social, economic and financial background and power situation

Investigations and data collection concerning social, economic and financial conditions and the existing power facilities, load forecast, power source development programs.

- (2) Comparative layout studies

Comparative studies of the previous development plans, based upon the existing topographic maps and relevant data.

- (3) Site reconnaissance

(a) Site reconnaissance in the vicinities of Sri Aman, Limbang, Sarikei and Kapit.

(b) Ground surface surveys on topography and geology of probable dam sites including reservoir areas, power station sites, switchyards and quarry sites.

(c) Surveys on a transportation program

- (4) Selection of the optimum site(s) and preparation of a field investigation program

- (a) Selection of the site(s)

Preliminary layout studies of several alternative sites will be conducted. Then, construction costs of the respective sites will be estimated on the basis of preliminary layout design, and costs and benefits will be examined. The optimum site(s) to supply power to Sri Aman, Limbang, Sarikei and Kapit will be selected among the alternative sites from the technical, economic, social and environmental viewpoints.

1. IDENTIFICATION STAGE

- (1) Investigation into Social, Economic and Financial Background and Power Situation

Investigations and data collection concerning social, economic and financial conditions and the existing power facilities, load, forecast and power source development programmes.

2

- (2) Comparative Layout Studies

Comparative studies of the previous development plans, based upon the existing topographic maps and relevant data.

- (3) Site Reconnaissance

(a) Site reconnaissance in the vicinities of Sri Aman, Limbang, Sarikei and Kapit.

(b) Ground surface surveys on topography and geology of probable dam sites including reservoir areas, power station sites, switchyards and quarry sites.

(c) Surveys on a transportation programme.

(d) Preliminary hydrological study.

- (4) Selection of the Optimum Site(s) and Preparation of a Field Investigation Programme

- (a) Selection of the Site(s)

Preliminary layout studies of several potential sites will be conducted. Based on these studies, preliminary layout designs shall be prepared which include determination of the power capacity, recommendations concerning key dimensions, size and type of all structures, the numbers of generating units, the main characteristics of the electrical and mechanical plant, including the transmission system. Then, construction costs of the respective sites will be estimated on the basis of these preliminary layout design, and costs and benefits will be examined. Selection of one optimum site, among the potential sites, which will meet the existing and forecast load demand for each of the four selected areas viz. Sri Aman, Limbang, Sarikei and Kapit, shall be made.

(b) Preparation of a field investigation program

The program of the field investigation works on the optimum site(s) will be prepared.

The field investigation works will include topographic surveys, seismic prospecting, drilling works and field/laboratory tests.

(5) Site confirmation

Following conditions shall be satisfied with a view to proceed to the Field Investigation Stage and Feasibility Design Stage.

(a) Identification of more than one (1) optimum site which will meet the required installed capacity of "a few MW".

(b) Signing of Minutes of Meeting between JICA and the Government of Malaysia which will include the name(s) of the optimum site(s) (hereinafter referred to as "the selected sites"), and a tentative time schedule of the Field Investigation Stage.

2. Field Investigation Stage

Based upon the results of studies at the Identification Stage, the following will be carried out.

(1) Topographic survey

Ground survey on the selected sites of dam, spillway, headrace, power station, tailrace, switchyard and quarry, including the installation of survey posts and bench marks.

Aerophotograph mapping will be also conducted if so found necessary at the Identification Stage.

(b) Preparation of a Field Investigation Programme

The programme of the field investigation works on the optimum site(s) will be prepared.

The field investigation works will include topographic surveys, seismic prospecting, drilling works and field/laboratory tests.

(5) Site Confirmation

Following conditions shall be satisfied with a view to proceed to the Field Investigation Stage and Feasibility Design Stage.

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(i) The Government of Malaysia shall then identify the best site(s) (hereafter referred to as the "selected site(s)") out of these optimum sites in consultation with JICA for the next stage of the Study.

(ii) Signing of Minutes of Meeting between JICA and the Government of Malaysia which will include the name(s) of the selected site(s) and a tentative time schedule of the Field Investigation Stage.

2. FIELD INVESTIGATION STAGE

Based upon the results of studies at the Identification Stage, the subsequent works will include the following:

(1) Topographic Surveys

Ground survey on the selected sites of dam, spillway, headrace, power station, tailrace, switchyard and quarry, including the installation of survey posts and bench marks.

Aerophotograph mapping will be also conducted if so found necessary at the Identification Stage.

(2) Geological and material survey

(a) Seismic prospecting

Seismic prospecting on the selected sites of dam, spillway, headrace, power station and quarry.

(b) Drilling works

Drilling works and permeability tests on the selected sites of dam, spillway, headrace, power station, tailrace and quarry.

(c) Trench excavation

Geological investigation by trench excavation and collection of soil and/or rock materials on the selected sites of dam, spillway and quarry.

(d) Test pitting

Collection of investigation materials by test pitting on the selected sites of concrete aggregates, quarry if necessary and river-bed materials.

(e) Field/laboratory tests

Mechanical tests of fill materials, soil tests, concrete aggregate tests, bed-rock mechanical tests and water quality tests.

(3) Hydrological survey

(a) Siting of hydrological observation stations (rainfall gauging stations, water level gauging stations and discharge observation stations).

(b) Actual measurement of discharge, sediment at the installed discharge observation stations.

(2) Geological and Material Survey

(a) Seismic Prospecting

Seismic prospecting on the selected sites of dam, spillway, headrace, power station and quarry.

(b) Drilling Works

Drilling works and permeability tests on the selected sites of dam, spillway, headrace, power station, tailrace and quarry.

(c) Trench Excavation

Geological investigation by trench excavation and collection of soil and/or rock materials on the selected sites of dam, spillway and quarry.

(d) Test Pitting

Collection of investigation materials by test pitting on the selected sites of concrete aggregates, quarry if necessary and river-bed materials.

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(e) Field/Laboratory Tests

Mechanical tests of fill materials, soil tests, concrete aggregate tests, bed-rock mechanical tests and water quality tests.

(3) Hydrological Survey

(a) Siting of hydrological observation stations (rainfall gauging stations, water level gauging stations and discharge observation stations).

(b) Actual measurement of discharge, sediments at the installed discharge observation stations.

(c) Hydro-meteorological study on flood/drought run-off and sediment.

(4) Power market survey

(a) Review and analysis of the present power system and relevant future program.

(b) Collection of information on a relevant future program of industrialization.

(c) Review and analysis of relevant information on growth of power consumption, available forecasts of power demand, characteristics of power consumption pattern, etc..

(5) Investigation and study of substations and transmission lines from power stations to the closest substation proposed.

(6) Study of social and environmental problems.

(7) Investigation of access road and transportation.

(8) Investigation of the houses, roads, land and rights to be submerged in the reservoir, and recommendation on compensation thereof.

3. Feasibility Design Stage

Based upon the results of studies at the Field Investigation Stage the following will be carried out.

(1) Study and review of a power generating scheme

(a) Study and review of a power generating scheme and study of optimum operation of the power stations for the demand.

(c) Hydro-meteorological study on flood/drought, run-off and sediments.

(4) Power Market Survey

All the available power and energy demand forecasts would be reviewed and on the basis of available data relating to population growth and development proposals load forecasts up to the year 2010 would be projected.

A planting programme for the selected project(s) to meet the demand would be formulated taking into consideration all other proposed power developments for the period.

(5) Investigation and study of substations and transmission lines from power stations to the closest substation proposed.

(6) Study of social and environmental problems.

(7) Investigation of access road and transportation.

(8) Investigation of the houses, roads, land and rights to be submerged in the reservoir, and recommendation and compensation thereof.

3. FEASIBILITY DESIGN STAGE

Based upon the results of the studies at the Field Investigation Stage, the subsequent works will include the following:-

(1) Study and Review of a Power Generating Scheme

(a) Study and review of a power generating scheme and study of optimum operation of the power stations for the existing and forecast demand.

(b) To ascertain the timing, staging and phasing of the development of the Project incorporated with the Sarawak Electricity Supply Corporation (hereinafter referred to as "SESCO")'s generation and transmission lines expansion plan.

(2) Feasibility design

The design work will include principal structures of civil works, steel structures, electro-mechanical equipments, temporary construction facilities, transmission line routes and transmission line structures.

(3) Cost estimation

The cost estimation of the Project will be broken down into local and foreign currency costs. The schedule of yearly disbursement will be prepared.

(4) Construction plan for implementation of the Project

The construction plan for the Project will be prepared using bar chart.

(5) Economic and financial analysis of the Project

Economic analysis will be carried out for power generation. The economic analysis will include computation of the capital cost and operation and maintenance costs, examination and economic analysis of alternative power sources, project analysis from the viewpoint of national economy, cost-benefit analysis, calculation of economic rate of return and sensitivity analysis.

Financial analysis will include determination of financial capital costs, cash flow, evaluation of financial internal rate of return.

IV STUDY SCHEDULE

The whole work will be conducted in accordance with the tentative time schedule as shown in Appendix I.

(b) To ascertain the timing, staging and phasing of the development of the selected project(s) taking into account of the Sarawak Electricity Supply Corporation's (SESCO) generation and transmission lines expansion plan.

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(2) Feasibility Design

The design work shall include the following:

- (a) Diversion works;
- (b) All principal structures of civil works such as dam, power station and appurtenant works;
- (c) All hydraulics steel structures;
- (d) Electro-mechanical equipments;
- (e) Infrastructure works;
- (f) Temporary construction facilities;
- (g) Transmission line routes; and
- (h) Transmission line structures.

(3) Cost Estimation

The cost estimation of the various components of the selected project(s) will be broken down into local and foreign currency costs. The schedule of yearly disbursement will be prepared.

(4) Construction Plan for Implementation of the Selected Project(s)

Preliminary design and construction works schedule would be prepared for the various stages of implementation of the selected projects up to the date of commercial operation of the generating plants. The schedule would detail all phases of construction planning including detailed site investigation, and design and preparation of tendering documents to cover a contract for the civil works, an electrical and mechanical contract and a transmission lines contract.

(5) Economic and Financial Analysis of the Selected Project(s)

Economic analysis will be carried out for power generation. The economic analysis will include computation of the capital cost and operation and maintenance costs, examination and economic analysis of alternative power sources, project analysis from the viewpoint of national economy, cost-benefit analysis, calculation of economic rate of return and sensitivity analysis.

Financial analysis will include determination of financial capital costs, cash flow, evaluation of financial internal rate of return.

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IV. STUDY SCHEDULE

The Study will be conducted in accordance with the tentative time schedule as shown in Appendix I.

V. REPORTS

1. The Government of Japan will prepare and submit the following reports in English to the Government of Malaysia.

(1) Inception Report

30 [copies.]

(2) Progress Report

30 [copies.]

(3) Technical Specifications

30 [copies.]

(4) Draft Final Report

30 [copies.]

(5) Final Report

[50 copies]

2. The Study team should ensure that all data, information, maps, materials and findings connected with the Study are kept confidential and not disposed of or revealed to any third party except with prior written consent of the Government of Malaysia. Such maps and aerial photographs are to be returned to the Government of Malaysia immediately upon completion of the Study. All reports when finalized and submitted to the Government of Malaysia shall remain the property of the Government of Malaysia.

VI. TECHNICAL UNDERTAKINGS

The division of technical undertakings by the Government of Japan and the Government of Malaysia is detailed in Appendix II.

VII. UNDERTAKINGS OF THE GOVERNMENT OF MALAYSIA

1. To facilitate the smooth conduct of the Study, the Government of Malaysia shall take the following necessary measures:

V. REPORTS

1. The Government of Japan will prepare and submit the following reports in English to the Government of Malaysia:

(1) Inception Report

30 copies [within 1 month after commencement of the Study.]

(2) Progress Report

30 copies [at the end of every other month.]

(3) Interim Report and Technical Specifications

30 copies [within 4 months after commencement of the Study.]

(4) Draft Final Report

30 copies [within ___ months after commencement of the Study.]

(5) Final Report

[80 copies within 2 month after receiving comments from the Government of Malaysia on the Draft Final Report.]

2. The Study team should ensure that all data, information, maps, materials and findings connected with the Study are kept confidential and not disposed of or revealed to any third party except with prior written consent of the Government of Malaysia. Such maps and aerial photographs are to be returned to the Government of Malaysia immediately upon completion of the Study. All reports when finalized and submitted to the Government of Malaysia shall remain the property of the Government of Malaysia.

VI. TECHNICAL UNDERTAKINGS

The division of technical undertakings by the Government of Japan and the Government of Malaysia is detailed in Appendix II.

VII. UNDERTAKINGS OF THE GOVERNMENT OF MALAYSIA

1. To facilitate the smooth conduct of the Study, the Government of Malaysia shall take the following necessary measures:

- (1) To inform the members of the Japanese Study team of any existing risk in the Study area and to take any measures deemed necessary to secure the safety of the Study team.
- (2) To secure the necessary entry permits for the Japanese Study team to conduct field surveys in Malaysia and exempt them from consular fees.
- (3) To exempt the members of the Japanese Study team from taxes and duties, as normally accorded under the provision of Malaysian General Circular No.1 of 1979, on equipment, machinery and other materials brought into and out of Malaysia for the conduct of the Study.
- (4) To exempt the members of the Japanese Study team from Malaysian income tax on his official emoluments in respect of their period of assignment in Malaysia in connection with the conduct of the Study but the Government of Malaysia shall retain the right to take such emoluments into account for the purpose of assessing the amount to be applied to income from other sources.
- (5) To provide the necessary facilities to the Japanese Study team for remittance as well as utilization of funds introduced into Malaysia from Japan in connection with the implementation of the Study.
- (6) To secure permission for entry into private properties or restricted areas for the conduct of the Study.
- (7) To provide the Japanese Study team with medical services when needed but the expenses will be chargeable to the members of the Japanese Study team.

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- (5) To provide the necessary facilities to the Japanese Study team for remittance as well as utilization of funds introduced into Malaysia from Japan in connection with conduct of the Study.
- (6) To secure permission for entry into private properties or restricted areas for the conduct of the Study.
- (7) To provide the Japanese Study team with medical services when needed but the expenses will be chargeable to the members of the Japanese Study team.

- (8) To make arrangements for the Study team to take back to Japan the data, maps and materials connected with the Study, subject to the approval of the Government of Malaysia in order to prepare the reports.
- (9) To facilitate prompt clearance through customs and inland transportation where possible, of equipment, materials and supplies required for the Study.
- (10) To indemnify any member of the Japanese Study team in respect of damages arising from any legal action against him in relation to any act performed or omissions made in undertaking the Study except when the two Governments agree that such a member is guilty of gross negligence or wilful misconduct.
- (11) To nominate SESCO to act as counterpart agency to the Japanese Study team and the Economic Planning Unit as the main coordinating body in relation with other governmental and non-governmental organizations concerned.
- (12) At its own expense to provide the Japanese Study team with the following:
- (a) Available relevant data and information relating to the Study.
 - (b) Counterpart personnel to the Study team during the Study period.
 - (c) Suitable office space with necessary office equipment both in Kuching and in the vicinity of the Study site.
 - (d) Credentials or identification cards.
 - (e) Adequate means of local transport for official travel only.
 - (f) Any other necessary communication facilities during the course of the Study, such as telephone, telex, transceivers etc..
 - (g) Clearing of paths for execution of field survey, geological survey and drilling work on the Project area.
- (8) To make arrangements for the Study team to take back to Japan the data, maps and materials connected with the Study, subject to the approval of the Government of Malaysia in order to prepare the reports.
- (9) To facilitate prompt clearance through customs and inland transportation where possible, of equipment, materials and supplies required for the Study.
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 - (d) Credentials or identification cards.
 - (e) Adequate means of local transport for official travel only.
 - (f) Any other necessary communication facilities during the course of the Study, such as telephone, telex, transceivers etc.
 - (g) Clearing of paths for execution of field survey, geological survey and drilling work on the Project area.

(h) Necessary labor for the Study.

VII UNDERTAKINGS OF THE GOVERNMENT OF JAPAN

In order to conduct the Study, the Government of Japan shall take the following measures.

- (1) To despatch, at its own expense, Study teams to undertake the Study in Malaysia.
- (2) To meet the cost of accommodation and housing expenses for the Japanese Study team during their period of assignment in Malaysia.
- (3) To perform technology transfer to the Malaysian counterpart personnel in the course of the Study.

IX CONSULTATION

The Government of Japan and the Government of Malaysia shall consult with each other in respect of any matter that is not agreed upon in this document and may arise from or in connection with the Study.

(h) Necessary labour for the Study.

VIII. UNDERTAKINGS OF THE GOVERNMENT OF JAPAN

In order to conduct the Study, the Government of Japan shall take the following measures.

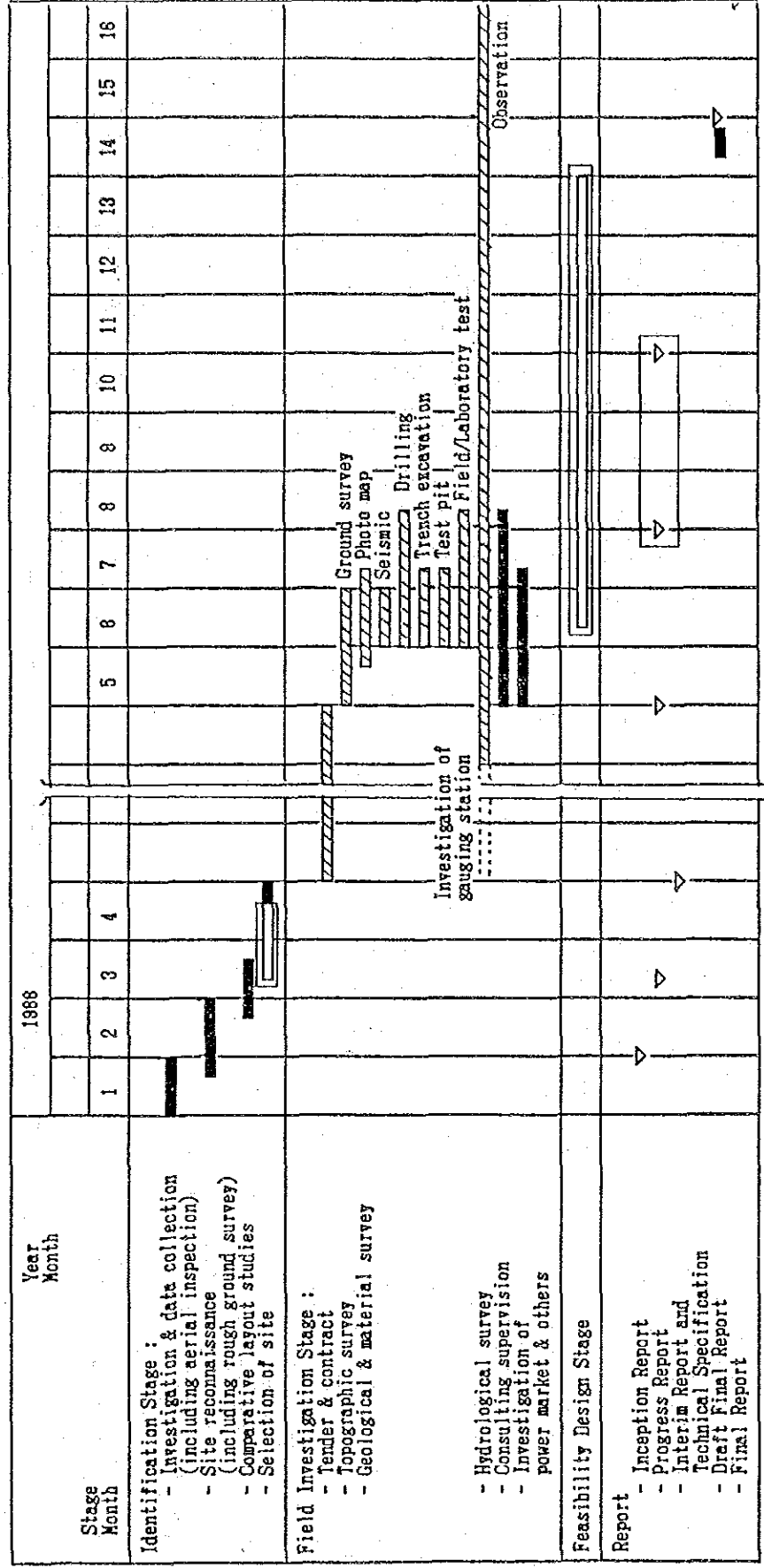
- (1) To despatch, at its own expense, Study teams in relevant fields to undertake the Study in Malaysia.
- (2) To bear travelling expenses and fares between Japan and Malaysia and within Malaysia if any, for members of the Japanese Study Team.
- (3) To meet the cost of accommodation and housing expenses for the Japanese Study team during their period of assignment in Malaysia.
- (4) To perform technology transfer to the Malaysian counterpart personnel during the course of the Study.
- (5) To give consideration to accept Malaysian counterpart personnel for training in Japan.

IX. CONSULTATION

The Government of Japan and the Government of Malaysia shall consult with each other in respect of any matter that is not agreed upon in this document and may arise from or in connection with the Study.

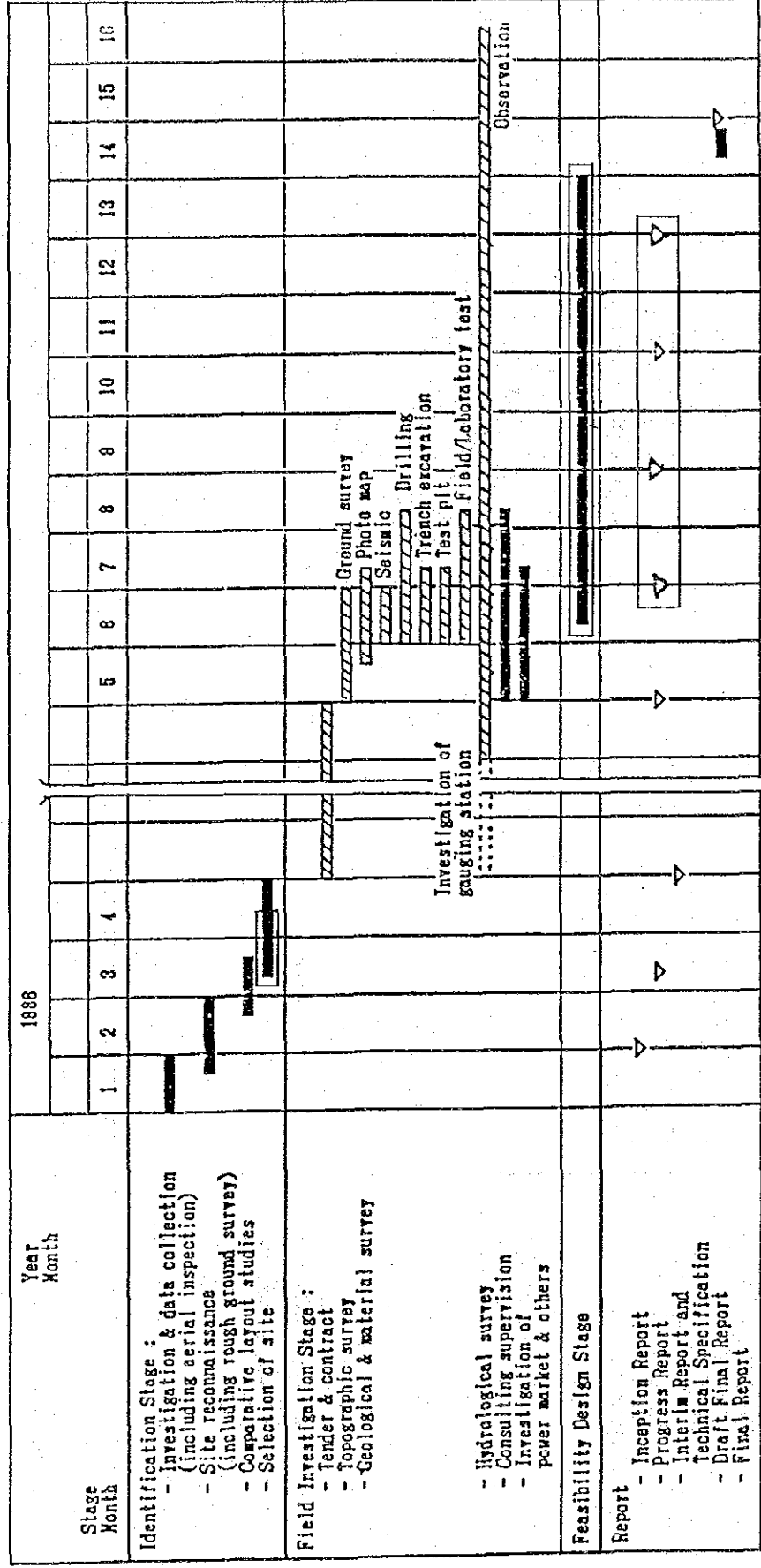
Appendix I : Tentative Time Schedule for Feasibility Study of Sarawak Small Scale Hydroelectric Power Development Project

Undertaking by M'sia
 Undertaking by Japan (Work in M'sia)
 Undertaking by Japan (Work in Japan)



Appendix I : Tentative Time Schedule for Feasibility Study of Sarawak Small Scale Hydroelectric Power Projects

Undertaking by M'sia
 Undertaking by Japan (Work in M'sia)
 Undertaking by Japan (Work in Japan)



Appendix II Technical Undertakings by the Government of Japan and the Government of Malaysia
for Feasibility Study of Sarawak Small Scale Hydroelectric Power Development Project

Working Items	Undertakings by the Government of Japan	Undertakings by the Government of Malaysia
1. Site reconnaissance	1. Site reconnaissance	1. Provision of counterpart engineers and laborers for guidance, clearing of paths, and transport facilities
2. Topographic survey	1. Programming	1. Provision of assistants and laborers for aerographic survey
2.1. Aerial survey and mapping	2. Preparation of specifications	2. Carrying out of the following items by contracting with local contractor(s)
	3. Check and decision of control points	(1) Survey of control points
	4. Supervision of aerial topographic survey together with SESCO counterparts	(2) Aero-photographing
		(3) Aerial triangulation
		(4) Provision of films/maps
		(5) Aerographic mapping on the scale of 1:5000 for the project site and 1:1000 ~ 1:2000 for the dam site
2.2. Ground survey	1. Programming	1. Provision of assistants and laborers for ground survey
	2. Preparation of specifications	2. Provision and ascertaining of height at the bench mark available in the nearest terminal to the site
	3. Determination of locations	3. Carrying out of ground survey by contracting with local contractor(s)
	4. Supervision of ground survey together with SESCO counterparts	4. Production of survey maps on the scale of 1:500 for the dam site and other main structures' sites, if necessary
	5. Despatch of a ground survey advisor	

Appendix II Technical Undertakings by the Government of Japan and the Government of Malaysia for Feasibility Study of Sarawak Small Scale Hydroelectric Power Projects

Working Items	Undertakings by the Government of Japan together with SESCO counterparts	Undertakings by the Government of Malaysia
1. Site reconnaissance	1. Site reconnaissance	1. Provision of counterpart engineers and laborers for guidance, clearing of paths, and transport facilities
2. Topographic survey	1. Programming	1. Provision of assistants and laborers for aerographic survey
2.1 Aerial survey and mapping	2. Preparation of specifications	2. Carrying out of the following items by contracting with local contractor(s)
	3. Check and decision of control points	(1) Survey of control points
	4. Supervision of aerial topographic survey	(2) Aero-photographing
		(3) Aerial triangulation
		(4) Provision of films/maps
		(5) Aerographic mapping on the scale of 1:5000 for the project site and 1:5000 for the dam site
2.2 Ground survey	1. Programming	1. Provision of assistants and laborers for ground survey
	2. Preparation of specifications	2. Provision and ascertaining of height at the bench mark available in the nearest terminal to the site
	3. Determination of locations	3. Carrying out of ground survey by contracting with local contractor(s)
	4. Supervision of ground survey	4. Production of survey maps on the scale of 1:500 for the dam site and other main structures' sites, if necessary
	5. Despatch of a ground survey advisor	

Working Items	Undertakings by the Government of Japan together with SESCO counterparts	Undertakings by the Government of Malaysia
3. Geological investigation 3.1. Drilling work and permeability tests	<ol style="list-style-type: none"> 1. Preparation of specifications 2. Selection of drilling locations 3. Geological assessment of boring cores 4. Supervision of geological investigations 5. Despatch of supervisors for drilling work and permeability tests 	<ol style="list-style-type: none"> 1. Provision of laborers and technical assistants 2. Carrying out of drilling works and permeability tests by contracting with local contractor(s)
3.2. Seismic prospecting	<ol style="list-style-type: none"> 1. Programming 2. Identification of locations of the area 3. Supervision of seismic prospecting 4. Despatch of an expert in seismic prospecting 5. Analysis of data 	<ol style="list-style-type: none"> 1. Provision of laborers for seismic prospecting 2. Carrying out of necessary topographic surveys 3. Provision of explosives for seismic prospecting 4. Provision of technical assistants and guards of powder magazine(s) 5. Provision of powder magazine(s) 6. Carrying out of recording
3.3. Trench and pit excavations	<ol style="list-style-type: none"> 1. Programming 2. Preparation of specifications 3. Determination of location 4. Supervision of trench and pit excavations 5. Geological assessment of results of trench and pit excavations 	<ol style="list-style-type: none"> 1. Carrying out of trench and pit excavation

Working Items	Undertakings by the Government of Japan	Undertakings by the Government of Malaysia
3. Geological investigation 3.1. Drilling work and permeability tests	<ol style="list-style-type: none"> 1. Preparation of specifications 2. Selection of drilling locations 3. Geological assessment of boring cores 4. Supervision of geological investigations <u>together with SESCO counterparts</u> 5. Despatch of supervisors for drilling work and permeability tests 	<ol style="list-style-type: none"> 1. Provision of laborers and technical assistants 2. Carrying out of drilling works and permeability tests by contracting with local contractor(s)
3.2. Seismic prospecting	<ol style="list-style-type: none"> 1. Programming 2. Identification of locations of the area 3. Supervision of seismic prospecting 4. Despatch of an expert in seismic prospecting 5. Analysis of data <u>together with SESCO counterparts</u> 	<ol style="list-style-type: none"> 1. Provision of laborers for seismic prospecting 2. Carrying out of necessary topographic surveys 3. Provision of explosives for seismic prospecting 4. Provision of technical assistants and guards of powder magazine(s) 5. Provision of powder magazine(s) 6. Carrying out of recording
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Working Items	Undertakings by the Government of Japan	Undertakings by the Government of Malaysia
3.4. Field/laboratory tests	<ol style="list-style-type: none"> 1. Programming 2. Preparation of specifications 3. Identification of location for sampling 4. Despatch of an expert 5. Analysis of data <u>together with SESCO counterparts</u> 	<ol style="list-style-type: none"> 1. Carrying out of the following items by contracting with local contractor(s) <ol style="list-style-type: none"> (1) Provision of laborers for sampling and local transport of sampled materials (2) Preparation of testing devices (3) Carrying out of tests
3.5. Preparation of geological maps	<ol style="list-style-type: none"> 1. Field reconnaissance 2. Geological assessment based on results of field geological explorations 3. Preparation of geological maps 	<ol style="list-style-type: none"> 1. Provision of the existing available data on geology and the past earthquake in the vicinity of the Study area
4. Hydrological investigation (including water quality and sedimentation, flood and drought studies)	<ol style="list-style-type: none"> 1. Planning of hydrological measurement 2. Analysis of data <u>together with SESCO counterparts</u> 	<ol style="list-style-type: none"> 1. Provision of available hydrological data 2. Installation of measuring instruments 3. Observation and recording 4. Provision of laborers for sediment sampling
5. Load demand and transmission studies	<ol style="list-style-type: none"> 1. Review and analysis of previous studies 2. Preparation of demand forecast and Power development program 	<ol style="list-style-type: none"> 1. Provision of previous studies on potential load demand and transmission requirement
6. Land use, social and environmental surveys	<ol style="list-style-type: none"> 1. Carrying out of surveys 	<ol style="list-style-type: none"> 1. Provision of relevant data 2. Provision of assistants and laborers for surveys

Working Items	Undertakings by the Government of Japan together with SESCO counterparts	Undertakings by the Government of Malaysia
3.4. Field/laboratory tests	<ol style="list-style-type: none"> 1. Programming 2. Preparation of specifications 3. Identification of location for sampling 4. Despatch of an expert 5. Analysis of data 	<ol style="list-style-type: none"> 1. Carrying out of the following items by contracting with local contractor(s) <ol style="list-style-type: none"> (1) Provision of laborers for sampling and local transport of sampled materials. (2) Preparation of testing devices (3) Carrying out of tests
3.5. Preparation of geological maps	<ol style="list-style-type: none"> 1. Field reconnaissance 2. Geological assessment based on results of field geological explorations 3. Preparation of geological maps 	<ol style="list-style-type: none"> 1. Provision of the existing available data on geology and the past earthquake in the vicinity of the Study area.
4. Hydrological investigation (including water quality and sedimentation, flood and drought studies)	<ol style="list-style-type: none"> 1. Planning of hydrological measurement 2. Analysis of data 	<ol style="list-style-type: none"> 1. Provision of available hydrological data 2. Installation of measuring instruments 3. Observation and recording 4. Provision of laborers for sediment sampling
5. Load demand and transmission studies	<ol style="list-style-type: none"> 1. Review and analysis of previous studies 2. Preparation of demand forecast and Power development program 	<ol style="list-style-type: none"> 1. Provision of previous studies on potential load demand and transmission requirement
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