る。本件調査においては同法に基づく環境調査を実施する。

6－2　対象地域及び範囲

マスタープランでは、マレイシア半島、Sabah、Sarawak を含むマレイシア国全土を調査対象地域とする。ただし、地域が広大なため、洪水被害や船舶の航行状況など河口における問題の程度に応じて主要河川を選定し、重点的に調査を実施する。

フィージビリティ調査ではマスタープランで選定した2河川（砂質1河川、泥質1河川）について調査を実施する。

6－3　調査項目及び内容

PHASE 1：マスタープラン調査

1. 調査項目

(1) 項目一覧

河口処理計画策定のために必要となる調査項目は下記のとおりである。

① 海岸線の形状・河口の位置
② 河口形状（常時、洪水時）
③ 河道条件（河床勾配、流量（常時・洪水時）、堆積等）
④ 海底地形断面
⑤ 汀線の経年変化
⑥ 海浜の底質
⑦ 海底　〃
⑧ 河道　〃
⑨ 波高・波向及び漂砂の方向
⑩ 潮位・潮差
⑪ 沿岸の潮流
⑫ 浚渫の有無・量と頻度
⑬ 洪水被害の状況
⑭ 土地利用
⑮ 航行船舶の喫水、船行頻度
⑯ 港の位置（河道内）
⑰ 利水の有無（河道内）
⑱ 既存の河川施設
⑲ 地域開発計画・事業

⑳ 社会・経済

㉑ 沿岸部の植生

㉒ 自然環境

(2) 各河川ごとのとりまとめ内容

a) 治水上の河口処理の意義

b) 舟運及び利水上の河口処理の意義

c) 河口閉塞の機構

d) 河口処理の手法とその問題点

上記の調査項目を確認するために、マスタープランにおいては関連資料の収集、河口現況調査、現地踏査を実施する。事前調査団調べによる本件調査実施にあたり活用できる資料及び保管先は附属資料6、及び7に記述しているとおりである。

河口現況調査の調査項目および方法については、調査団が現地踏査を開始する以前に準備する必要がある。その内容は上述の調査項目を踏まえるべきであり、回答の精度を一定に保つため、予め模範となる回答例も準備しておく必要がある。

現地踏査は、河口問題が深刻な河川を中心に実施し補足情報を収集する。

以上の調査作業を通じて各々の河川の河口部における問題を明確にし、上記a)～d)の内容をもとに、5章で記述した分類を参考にして、河口とその処理方針の類型化を行う。

2. 対象河川の選定

本件調査においては、まずPhase 1で河口現況調査を実施する約100河川の中からマスタープランの計画対象とする約80河川を選択し、またPhase 2においても、対象となる2河川を選択する必要がある。その際、下記の条件を総合的に考慮して対象河川を選択する。

(1) 治水上の意義

河口部における土砂の堆積が著しく、洪水を頻繁に起こしている河川であっても、近辺に洪水被害から守るべき価値（社会・経済・環境面から検討）を有するものがなければ、治水上の意義は見い出せない。河口処理によって治水効果の期待される河川を選択する。

(2) 舟運及び利水等

本件調査の目的に沿い、船舶の航行の頻繁な河川を選択する。また河口処理計画の便益効果を高いものとするため、水門等の利水施設を有する河川を選択する。

(3) 閉塞の原因と対策の容易さ

河口処理計画の立案は技術的に難しい側面を有するため、具体的な処理方法を明確に見い出すことのできる河川を選択する。対策の選定にあたっては、次の点を十分に考慮する。

① 浚渫・・・ランニングコスト、必要施設

② 導流堤 a) 河口砂州の阻止・・・周辺海岸への影響（サンドバイパスの実施等）

b） 河口流の制御・・・長期的な機能の確保

③ 離岸堤、ヘッドランド・・・機能の確認、周辺海岸への影響

④ 上記の複合・・・最適化の検討

3. 環境調査

マスタープランの段階では、ＥＩＡで定められた環境調査用マトリックスを、環境調査担当団員が関連資料、現地調査及び過去の業務経験に基づき作成し、環境影響の概要を調べる。

PHASE 2：フィージビリティ・スタディ

1. 補足調査

Phase 1に引き続き、上述の調査項目についての関連資料を収集する。

2. 水文観測機器の設置及び観測

Phase 1のアンケート調査の結果がまとまった時点で、カウンターパートと協議を行い、Phase 2の対象となる砂質1河川、泥質1河川を決定する。

対象となる2河川の決定後は、直ちに各河川について、下記の計測器を設置する。

① 河口沖・・・波高・波向・流速計

② 河道内・・・水位・流速計

観測にあたっては、データの精度を高めるため、調査団が現地にいない間にも継続して観測を続けていく必要がある。したがって、カウンターパート独自で観測を実施できる体制を確立しなければならない。

3. 河口縦横断測量

測量範囲は、河口から上流約2㎞までとし、測線間隔は河口から50ｍごとの測線を6本取り、それ以降は100ｍ間隔とする。

4. 深浅測量

測量範囲は、海岸線方向は、河口を中心として左右それぞれ約1㎞とし、海岸線に直角方向は、陸上は汀線から100ｍ、海域は水深40ｍまでとし、測線間隔は100ｍとする。

5. 底質材料調査

河口及び海底部における底質材料を採取し粒度分析、比重の測定を行う。採取断面は、河道では5断面とし、採取地点は1断面につき3点を選ぶものとする。また、海浜においては、採取地点として汀線付近、波打上部、海浜頂上部の3点を選び、断面数は5断面とする。海底においては海浜と同じ5測線で水深40ｍの範囲まで、およそ4点選ぶものとする。

6. データ整理システムの充実と水収支解析

Ｆ／Ｓ対象2河川について、既存観測データ及び本件調査の観測機器の設置により入手したデータに関して、データを整理するためにパソコン等を使用した簡易なデータ処理システム開発を行い、それらデータに基づき水収支解析を行う。

7. 河口閉塞機構の検討

マスタープランにおける河口の類型化を基にして、対象河川の閉塞機構を定量的に把握する。

① 当該河口の長期的な地形変化傾向の把握

河道、河口、周辺海岸の長期的な地形変化傾向を、過去の地形図、航空写真、地質図等から調査する。更にマングローブ等の植生と地形変化との関係を検討する。

② 現況の土砂移動モデルの作成

河口周辺における土砂移動の機構をモデル化する。考慮すべき事項は、河川からの土砂供給、潮汐流による土砂移動、波浪による漂砂、生化学作用による土砂堆積である。

③ 現状の河口閉塞と人為的行為の関係の把握

陸域開発による土砂供給状況の変化、浚渫、海岸及び河道の構造物の建設等が河口閉塞に及ぼす影響を把握する。

④ 将来の土砂移動モデルの作成

①、②、③の結果を基に将来の土砂移動の予測モデルを作成する。

8. 対策手法の検討（水理模型実験、数値計算）

マスタープランにおける河口の類型化を基にして、対象河川の河口処理方針を立案する。立案にあたっては、当該河口の土砂移動モデルを考慮して、長期的にみて最も効率的となる対策手法を選定する。立案した河口処理方針を基にして、作成した将来の土砂移動モデルのもとで考えられる河口処理の具体的な検討を行う。検討の内容としては、以下のような項目が挙げられる。

1）砂質の海岸に位置する河口に関する項目

① 河口砂州の形成制御

移動床平面実験により河口砂州の形成の再現及び構造物による河口維持効果に関する検討を行う。

② 導流堤による河口流制御

導流堤による河口流の制御により、河口への土砂堆積を阻止する効果を固定床平面実験により検討する。

2）砂質、泥質の海岸に位置する河口に共通の項目

① 浚渫の効果予測

河床変動計算により、河川流、潮汐流、波浪の影響による河口部土砂堆積の予測を行い、浚渫の効果、手法を検討する。河床変動計算には、一次元河床変動計算に必要な改良を加えたモデルを用いる。

② 河口処理の効果

数値計算（二次元不定流）により、河口処理による氾濫の低減効果を予測する。

③ 周辺海岸への影響調査

移動床平面実験（砂質のみ、1）－①）、汀線変化モデルを用いた数値計算により河口処理による周辺海岸への影響を検討する。

以上の検討結果に加え、土地利用規制等の法的な手法も含めて、最終的な対策手法の提案をとりまとめる。なお、水理模型実験は、アンパンにあるＤＩＤの水理研究所で実施し、模型の設計は調査団員が担当し、模型の作成は現地業者に委託する。実験は調査団員とカウンターパートとの共同作業で行う。

9. 環境調査

Phase 1で作成したマトリックスに基づき影響が予想される項目を取り上げ、法律で定めるプレリミナリーＥＩＡに基づく調査を実施する。調査項目については、マトリックスが完成した時点でマレイシア側と協議・決定する。実施にあたってはマレイシア国の環境事情に詳しい現地コンサルタントを活用する。日本側調査団は同調査の実施に関し指導・監督を行う。

10. 組織・法制

河口管理を実効的なものとするために、組織及び関連する法制について検討し、マレイシア側と協議して機能的な河口管理体制を提言する。

11. 施設設計

必要となる施設の規模及び現地の状況に見合った設計条件に基づき、基本的な施設の設計を行う。

12. 維持・管理・運用計画

選択した施設の維持・管理・運用計画を以下の項目につき策定する。

- 運用計画
- 管理システム
- 維持システム

13. 事業費積算

事業実施に要する費用を算定する。

14. 施工計画

施設を施工するために必要な材料、資機材計画及び工程計画を策定する。

15. プロジェクト評価

事業実施による便益を算定し、それに係る社会的経済的効果を分析する。

16. 実施計画

17. 提言

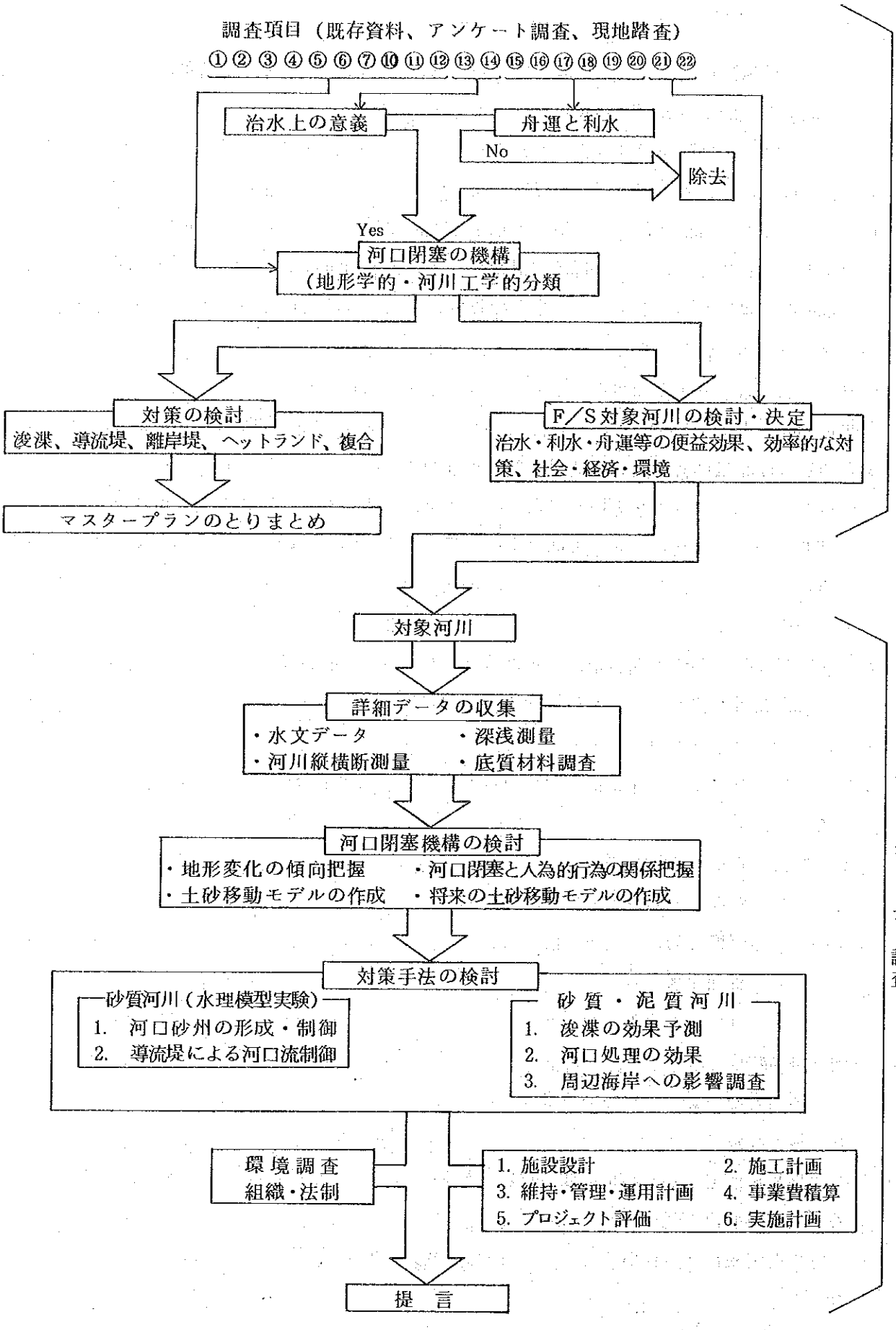

調査項目（既存資料、アンケート調査、現地踏査）
①②③④⑤⑥⑦⑩⑪⑫⑬⑭⑮⑯⑰⑱⑲⑳㉑㉒
治水上の意義
舟運と利水
No
除去
Yes
河口閉塞の機構
（地形学的・河川工学的分類
対策の検討
浚渫、導流堤、離岸堤、ヘットランド、複合
F／S対象河川の検討・決定
治水・利水・舟運等の便益効果、効率的な対策、社会・経済・環境
マスタープランのとりまとめ
マスタープラン調査
対象河川
詳細データの収集
・水文データ
・深浅測量
・河川縦横断測量
・底質材料調査
河口閉塞機構の検討
・地形変化の傾向把握
・河口閉塞と人為的行為の関係把握
・土砂移動モデルの作成
・将来の土砂移動モデルの作成
対策手法の検討
砂質河川（水理模型実験）
1. 河口砂州の形成・制御
2. 導流堤による河口流制御
砂質・泥質河川
1. 浚渫の効果予測
2. 河口処理の効果
3. 周辺海岸への影響調査
環境調査
組織・法制
1. 施設設計
2. 施工計画
3. 維持・管理・運用計画
4. 事業費積算
5. プロジェクト評価
6. 実施計画
提言
フィージビリティ調査

図6－1　調査フロー

フィージビリティ調査の検討結果についてとりまとめを行い、事業の実施についての提言を行う。

6－4　調査工程

調査は、マレイシア国内での現地調査と、日本国内で行われる解析作業とで構成される。S／W（案）工程に示されているように、Phase 1マスタープランの策定に14カ月を当て、Phase 2フィージビリティ調査に16カ月をかけ、全体で30カ月で完了する予定である。

6－5　報告書

調査期間中、以下の種類の報告書を作成しマレイシア側に提出する。

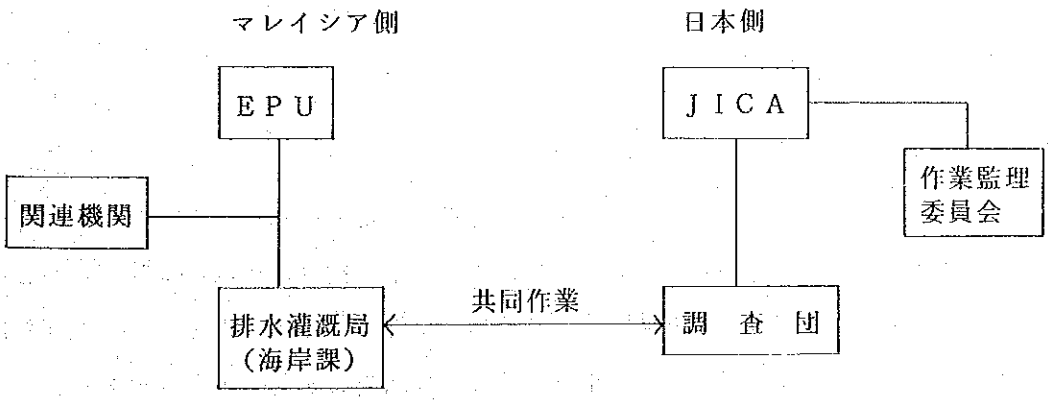
(1)	インセプション・レポート	40部
(2)	プログレス・レポート(1)	40部
(3)	プログレス・レポート(2)	40部
(4)	インテリム・レポート	40部
(5)	プログレス・レポート(3)	40部
(6)	プログレス・レポート(4)	40部
(7)	ドラフト・ファイナル・レポート	40部
(8)	ファイナル・レポート	100部

6－6　調査の実施体制

本件調査の実施にあたっては、調査団は、ＪＩＣＡが設置予定の作業監理委員会の技術的諮問を受けつつ作業を遂行するものとする。

他方、本件調査のマレイシア側担当官庁は首相府経済計画局（Economic Planning Unit）で、実施機関は農業省の排水灌漑局（Drainage and Irrigation Department）である。

本件調査の実施体制の概要は次のとおりである。



6－7　要員計画案（担当分野）

(1)　総括

(2)　河口処理計画

(3)　水文調査

(4)　治水計画

(5)　海象調査

(6)　地形・底質調査（河口地形、底質調査）

(7)　流砂・漂砂調査（河川流砂、海岸漂砂、土砂収支調査）

(8)　測量

(9)　施設設計

(10)　施工計画・積算

(11)　水理模型実験

(12)　数値計算（河床変動、汀線変化調査）

(13)　社会経済／プロジェクト評価

(14)　組織・法制

6－8　調査用資機材

本件調査で使用予定の機材は下記のとおりである。

波高・波向・流速計	2台
自記水位計	2台
流速計	2台
パーソナルコンピューター	2台
コピーマシーン	2台
実験室用波高計	2台
実験室用記録計	1台
実験用撮影機材（ビデオ、カメラ）	1式

6－9　調査実施上の留意点

(1)　河口処理計画の立案について

河口処理計画の立案にあたっては、海岸工学、河川工学双方の知識が求められる。特にマレイシア国のような熱帯地域の河口においては、その対策立案は技術的に困難なものとなるが、技術協力の観点に基づき、調査期間中は技術移転に努め、計画立案にあたっては長期的に有意義かつ最も効率的な提案を行えるよう十分な技術的対策を講じる必要がある。

(2) Phase 1：マスタープランの精度について

本件調査のマスタープランは既存資料の収集、ローカルコンサルタントを活用して実施する河口現況調査、現地調査を3本柱として実施する。マレイシア側と協議した際には、マスタープランの精度として1985年に終了した「全国海岸侵蝕調査」(National Costal Erosion Study)を参照してほしいとの要望があった。本件調査はその要望を踏まえて実施する。

(3) マスタープランの計画対象河川数について

マスタープランの対象河川数は、河口現況調査を実施した100河川の中からおよそ80河川を選定することとし M／Mに残しているが、マレイシア側との協議ではマレイシア側はかなり規模の小さい河川もマスタープランの対象として想定しているとの感触を得ている。80河川という数字は固定的な数字ではないため、河口現況調査の結果次第では、マレイシア側と協議のうえマスタープランの対象河川を変更することもやぶさかではない。

(4) F／S 対象河川の選定について

F／S 対象河川の選定基準については、本格調査の内容の中で述べているが、調査を効率よく実施するために、対象2河川間の距離、交通、アクセスの容易さ等も考慮する必要がある。

(5) マレイシア国との関係について

マレイシア国は既に中進国に属しており、カウンターパートの教育水準もかなり高い。またＪＩＣＡの技術協力の経験も豊富なため、調査実施中に調査業務以外の事項を要求されることが多々ある。技術移転は開発調査の目的の一つであるため、カウンターパートからの要求を無下に断る必要はないが、本来の調査業務を優先的に遂行するために、それらの要求に対して適宜対応する姿勢が求められる。

また本件調査の場合、関連機関が多岐にわたるため、その調整に十分注意を図ることが必要である。

附　　属　　資　　料

1. マレイシア国政府からの技術協力要請書
2. SCOPE OF WORK （S／W）
3. MINUTES OF MEETING
4. DID水理研究所概要
5. 面 談 者 リ ス ト
6. 質　問　書
7. 収集資料リスト
8. 基礎資料の賦存状況
9. 環境調査マトリックス
10. 地　形　図

附属資料1. マレイシア国政府からの技術協力要請書

TERMS OF REFERENCE

NATIONAL RIVER MOUTHS STUDY

1. BACKGROUND

1.1 INTRODUCTION

Malaysia has a total land area of 329,750 sq. km comprising the mainland of Peninsular Malaysia (131,590), Sarawak (124,449), and Sabah (73,711). Peninsular Malaysia has a very long coastline of 1,642 km, and similarly Sarawak and Sabah has a coastline of 875 km and 1,909 km respectively. The total length of the Malaysian coastline including the islands of Penang, Langkawi, Ticman and Labuan is about 4,840 km.

There are numerous estuaries and creeks located along the coast which serve as the main channels for discharging flood waters from the land into the seas. Heavy sediment discharges from the upper catchments, coupled with the long-shore drift, and small tidal volume, has resulted in the clogging of many of the river mouths, thereby reducing their discharge efficiency. During the monsoon periods, when the flood discharges can be as high as 100 times the mean flows, the water level backed up by the clogged river mouths have cause increased flooding in the urban areas and coastal settlements or agricultural lands near the river mouths. Quite often, the clogged river mouths have also caused obstruction to navigation of coastal merchant shippings and fishing boats.

Some efforts to alleviate the problem of clogged river mouths have been implemented by various government agencies. The works include dredging and the construction of training dykes. Some of these efforts have succeeded and some have failed. A comprehensive examination of the problem of river mouths clogging and the measures to mitigate them is therefore necessary.

1.2 NECESSITY OF THE STUDY

Malaysia has a tropical monsoonal climate with abundant rainfall throughout the year. The heaviest rainfall occurs during the northeast monsoon over the east coast of Peninsular Malaysia, north Sabah and south Sarawak. Heavy rain also occurs during the southwest monsoon, while heavy thunderstorm occurs during the inter-monsoon periods.

Flood occurs during the northeast monsoon period on the east coast of Peninsular Malaysia, Sabah and Sarawak, and on the west coast of Peninsular Malaysia during the southwest monsoon. In the east coast in particular, vast areas are subjected to annual flooding causing much property damage and sufferings to the people affected.

During the recent 1987 flood, the damage to the properties in the State of Kelantan and Terengganu alone was estimated more than $M50 millions.

River mouths in Malaysia, especially those on the east coast of Peninsular Malaysia suffer from siltation prblems due to drifting sand. This phenomenon has resulted in a number of important river outlets being badly blocked by sand bars, which reduce their efficiency in discharging flood waters thus aggravating the flood situation in the lower basin.

The Drainage and Irrigation Department has an annual programme for river mouths dredging in order to improve the discharge efficiency of river mouths suffering from siltation problems. Due to lack of expertise available within the Department, the dredging programme has achieved only limited success.

In a majority of cases, the dredged river mouths are silted up again within a couple of years, thus nullifying the dredging carried out.

Recognising the mignitude and severity of the problem of river mouths clogging in the country, the Government of Malaysia is keen to carry out a comprehensive study with a view to prepare a practical/realistic master plan to solve such problems.

The study will cover the whole of Peninsular Malaysia, Sabah and Sarawak, and will involve extensive data collection, site investigations, verification, technical studies, evaluation of existing measures/works implemented, and case studies of selected river mouths.

2. OBJECTIVES OF THE STUDY

2.1 The main objectives of the Study are:-

(1) To assess the magnitude of river mouths clogging in the country and its effects on flooding and other problems (including gated river mouths);

(2) To evaluate existing improvement works to determine their suitability;

(3) To study cost effective solutions for river mouths problems;

(4) To formulate a master plan for improvement of river mouths for mitigating flood and other related problems;

(5) To prepare case studies on selected river mouths;

(6) To prepare phased implementation programme for improving river mouths.

(7) To appraise and review the adequacy of the existing

Governmental institutions and legislation for control and implementation of river mouths improvement project and recommend appropriate measures to remedy any deficiencies.

2.2 Study Area

The study area shall cover the whole of Peninsular Malaysia, Sabah and Sarawak.

3. SCOPE OF WORK

The study involves two phases, Phase 1 and Phase 2. Phase 1 is preliminary reconnaissance study and preparation of a master plan of the river mouths flood mitigation and improvement works. Phase 2 is a case study for selected river mouths based on priority. The selected river mouths shall represent a typical problem in the country i.e. river mouths in sandy coast, river mouths in a mud coast and gated outlet.

The work to be carried out in the study shall be as follows:

PHASE 1

3.1 Collect and review of all related study reports. All pertinent studies, reports and other documents shall be collected and reviewed. The studies related to the project are listed in Appendix -1.

3.2 Collect and Review Existing Available Data

(1) Hydrological and Meteorological Data:

- Wave height, period, wave direction and their frequency of occurance.
- River mouths water level,
- River mouths discharge.
- Tidal level.
- Tidal prism.
- Littoral drift sand.
- Wind direction and velocity.

(2) River and Coast Topographic Survey Results:

- Aerial photos.
- River course longitudinal cross section.
- Beach survey.

- Shoreline survey.

- River mouths longitudinal and cross leveling.

(3) Riverbed and Bottom Material Survey Data:

- River mouths bottom material.

- River course bottom material.

(4) Existing Data and Information:

- Existing river mouths improvement project.

- Basin management and erosion control.

- Development policy.

(5) Socio-economic Conditions:

- Flood and other damage survey.

(6) Others:

- Sediment transport survey.

- Coastal current survey.

- Environment survey.

- Water quality survey.

- Design guideline for river mouths improvement.

3.3 Taking aerial eyeview photos

3.4 Analysis of Collected Data and Information

- Assessment of river mouths problems.

- Preparation of a rivers mouths improvement alternatives.

3.5 Installation of observation facilities and additional data collection

- Water level gauges.

- Staff gauges.

- Wave gauges.

3.6 Formulation of Master Plan

- Formulation of river mouths improvement schemes.
- Indentification of urgent measures.
- Recommendation for the Governmental institutions and legislation.

PHASE 2

3.7 Case Study

(1) Basic Investigation:

- Wave.
- River mouths water level.
- Tidal level.
- Littoral drift sand.
- Bottom material.
- Water quality.
- Wind direction and velocity.
- River and coast topographic.
- River mouths model experiment.
- Socio-economic.
- Others.

(2) Analysis of Collected Data and Information:

- Hydrological and hydraulic conditions.
- Socio-economic conditions.

(3) Preparation of conceptual design and implementation program:

- Decision of river mouths improvement methods.
- Physical model testing.
- Improvement works plan for river mouths.
- Conceptual design of improvement works.

- Cost estimation.

- Project evaluation including preliminary Enviromental Impact Assessment.

- Implementation program.

- Monitoring and data collecting system.

- Institutional arrangements.

4 DURATION AND TIMING OF THE STUDY.

The study will be executed in accordance with the attached tentative schedule.

The study will be conducted within 20 months and is expected to commence in March 1989 and final report is expected to be submitted by October 1990.

5 REPORTS

The study team shall prepare and submit the following reports in English to the Government of Malaysia:

Phase 1

(1) Inception Report (40 copies)

This report is to be submitted within two (2) months from the commencement of the study, and it shall contain statement showing the methods of the study.

(2) Bimonthly Progress Report

The report shall cover the activities of the study team and the findings of the studies in the last two (2) months and shall give an outline of progress and an indication of proposed changes to future program of works.

(3) Interim Report (40 copies)

This report shall be submitted within six (6) months from the commencement of the study and it shall contain the results of assessment of the existing situations and an optimum master plan for improvement of river mouths.

(4) Draft Final Report (40 copies)

This report shall be submitted within nine (9) months from the commencement of the study. It shall cover all the results of the study.

(5) Final Report (100 copies)

This report shall be submitted within two (2) months after receiving the comment of the Government of Malaysia for the Draft Final Report.

Phase 2

(1) Bimonthly Progress Report

The report shall cover the activities of the study team and the findings of the studies in the last two (2) months and shall give an outline of progress and an indication of proposed changes to future program of works.

(2) Interim Report (40 copies)

This report shall be submitted within fifteen (15) months from the commencement of the study and it shall contain the results of assessment of the existing situations and an optimum master plan for improvement of river mouths.

(3) Draft Final Report (40 copies)

This report shall be submitted within seventeen (17) months from the commencement of the study. It shall cover all the results of the study.

(4) Final Report (100 copies)

This report shall be submitted within two (2) months after receiving the comment of the Government of Malaysia for the Draft Final Report.

6 EXPERTISE REQUIRED

The following expertise may be required for satisfactry completion of the study:

(1) Team Leader

(2) Hydrologist

(3) River Engineer

(4) Coastal Engineer

(5) Structural Engineer

(6) Port Engineer

(7) Surveyor

(8) Hydraulic Scale Model Specialist

(9) Socio-economic Specialist

(10) Project Economist

(11) Geotechnic Specialist

7 ON-THE-JOB-EXPERIENCE

The Government may wish to assign one or more professional staff to the Consultant for on-the-job experience with the project. A decision will be made on this matter at the time of contract negotiations and the Consultant should be prepared to accomodate the Government's requirements in this regard.

8 GOVERNMENT RESPONSIBILITY

To facilitate the smooth conduct of the Study, the Government of Malaysia will take the necessary measures:

1. To inform the members of the 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 and 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 emolument 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 remmitance as well as utilization of funds introduced into Malaysia from Japan in connection with the 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 provide the Japanese study team with available data, maps and information necessary for the execution of the Study.

9. To make arrangement for the study team to take back to the home country the data, maps and materials connected with the Study, subject to the approval of the Government of Malaysia, in order to prepare the reports. All such information shall be returned to the Government of Malaysia before the end of the Study,

10. To provide the Japanese study team with suitable office space with clerical service and necessary office equipment.

11. To provide the Japanese team with adequate means of local transport for official travel only.

12. To indemnify any member of the Japanese study team in respect of damages arising from legal action against him in relation to any act performed or omnisions made in undertaking the Study except when the two Governments agree that such a member is guilty of gross negligence or wilful misconduct.

9. RELATED STUDIES

Reports listed in Appendix-1 are available.

10. PROJECT STUDY CORDINATION/MONITORING

The Drainage and Irrigation Department (DID), Malaysia nominate as the main counterpart agency for the Study and the Economic Planning Unit as the main monitoring and coordinating body in relation to other relevant Government and non-Governmental Organisation.

11. LOCAL COSTS

The local costs of the proposed study, which cover the provision of local facilities such as reasonable transport, office space, etc., for the Study Team, shall be met from the development vote of the Drainage & Irrigation Department (Vote Head: P19/148) in accordance with the Malaysian General Circular No. 1 of 1979.

Appendix - I

NATIONAL RIVERMOUTHS IMPROVEMENT STUDY

Information/Data Base

I. Completed Studies

1. National Coastal Erosion Study (1985)
   Stanley Consultants.Inc. et al.

2. National Water Resources Study (1982)
   Japan International Cooperation Agency (JICA)

3. Kelantan Minor Ports Study (1985)
   Delft Hydraulics laboratory (DHL)

4. Perlis Minor Ports Study (1984)
   Japan International Cooperation Agency (JICA)

5. Kelantan River Basin Study (1977)
   ENEX

6. Terengganu River Basin Study (1975)
   Snowy Mountain Engineering Corporation (SMEC)

7. Kemasin-Semerak Intergrated Rural Development Project
   Feasibility Study (1979)
   SCET

8. Terengganu Coastal Region Study (1980)
   Maunsell & Partners Pty Ltd.

9. Golok River Basin Study (1984)
   Snowy Mountain Engineering Corporation (SMEC)

10. Besut Fishing Port Investigation (1980)
    Drainage and Irrigation Department.

11. Environmental Design Conditions Study for the Peninsular Malaysia (offshore) Gas Project (1981)
    Danish Hydraulics Institute (DHI)

12. Oceanographic Observations near 4° 30' Lat. and 103° 30' Long. (1981)
    EG & G Environmental Consultants

13. Regional Study on the Integrated Development of South Terengganu (1984)
    Japan International Cooperation Agency (JICA)

14. Perlis Master Plan Study (1987)
    Perunding Bersatu Sdn. Bhd.

15. Tanjung Berhala Harbour.
Hydraulic Investigation Final Report.
Danish Hydraulics Institute.

16. Fishing Port Kuantan, Preliminary Design.
General Report.
Bish and Partners Consulting.

17. Kuala Baram, Sarawak.
Effect of Training Walls on Adjacent Beaches.
Wallingford, Hydraulics Research Station.

18. Kuala Baram, Sarawak.
Studies of Bar Deepening.
Wallingford, Hydraulics Research Station.

18. Master Plan For Development of
Sabah Port Expansion.
Posford Parry and Partners.

II. On-going Studies

1. Besut Flood Mitigation Study.
Kumarasivam, Tan and Arrifin Sdn. Bhd. in asscciation with Camp Scott Furphy Pty.Limited.

SCOPE OF WORK

FOR

THE

NATIONAL RIVER MOUTHS STUDY

AGREED UPON BETWEEN

THE ECONOMIC PLANNING UNIT

OF

THE PRIME MINISTER'S DEPARTMENT

ON BEHALF OF

GOVERNMENT OF MALAYSIA

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

Kuala Lumpur

27 March, 1989

MS. LIN MUI KIANG
for DIRECTOR GENERAL,
ECONOMIC PLANNING UNIT,
PRIME MINISTER'S DEPARTMENT,
on behalf of
THE GOVERNMENT OF MALAYSIA

MR. KOJI NUKAZAWA
LEADER,
PRELIMINARY SURVEY TEAM
on behalf of
JAPAN INTERNATIONAL
COOPERATION AGENCY

I. INTRODUCTION

In response to request of the Government of Malaysia, the Government of Japan has decided to conduct National River Mouths Study in Malaysia (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 programmes 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. OBJECTIVES OF THE STUDY

The objectives of the Study are:

1. To formulate the Master Plan on improvement of selected river mouths for flood mitigation and navigation.
2. To conduct the Feasibility Study on improvement of two (2) selected river mouths for flood mitigation and navigation.

III. STUDY AREA

The study area shall cover the whole country of Malaysia.

IV. SCOPE OF THE STUDY

The activities undertaken by JICA Study Team(hereinafter referred to as "The Study Team")shall be in two phases as follows:

1. Phase I, Master Plan Study

(1) Collection and review of available data information related to The Study

1) socio-economic parameters
2) meteorology and hydrology
3) topography and geology including aerial photograph
4) land use
5) river mouth condition
6) flood damage records
7) navigation informations
8) existing projects and plans for river mouth improvement
9) existing projects and plans for coastal area development

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10) previous study
11) others

(2) Field Survey

1) river mouth survey
2) hydrological observation
3) flood damage survey
4) navigation survey
5) socio-economic survey
6) others

(3) Study and Analysis

1) meteorological and hydrological analysis
2) identification of river mouth problems
3) examination of river mouth improvement alternatives
4) social and environmental study

(4) Formulation of Master Plan

formulation of master plan on improvement of river mouths for flood mitigation and navigation.

2. Phase II, Feasibility Study

(1) Supplemental survey

1) data collection
2) socio-economic study
3) topographic survey
4) bottom material sampling
5) sedimentation and siltation analysis
6) model experiment
7) environmental impact study

(2) Project Formulation

1) preliminary design
2) construction schedule
3) cost estimation
4) project evaluation
5) implementation plan

V. STUDY SCHEDULE

The Study will be executed in accordance with the attached tentative schedule.

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VI. REPORTS

JICA shall prepare and submit the following reports in English to the Government of Malaysia.

(1) Inception Report

Forty (40) copies within forty five (45) days from the date of the commencement of the Study.

(2) Progress Report (1)

Forty (40) copies within six (6) months from the date of the commencement of the Study.

(3) Progress Report (2)

Forty (40) copies within ten (10) months from the date of the commencement of the Study.

(4) Interim Report

Forty (40) copies within fifteen (15) months from the date of the commencement of the Study.

(5) Progress Report (3)

Forty (40) copies within ten (20) months from the date of the commencement of the Study.

(6) Progress Report (4)

Forty (40) copies within twenty four (24) months from the date of the commencement of the Study.

(7) Draft Final Report

Forty (40) copies within twenty-eight (28) months from the date of the commencement of the Study. The Government of Malaysia will provide the Study Team with its comments within one month after receipt of the Draft Final Report.

(8) Final Report

Hundred (100) copies within two (2) months after receipt of the Government of Malaysia's comments on the Draft Final Report. All comments given by the Government of Malaysia will be compiled in the preparation of the Final Report.

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The Study Team shall ensure that all data, information, maps, materials and findings connected with the Study are kept confidential and not revealed or disposed of to any third party except with the 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.

VII. UNDERTAKINGS OF THE GOVERNMENT OF MALAYSIA

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 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 Study Team to conduct field survey in Malaysia and exempt them from consular fees.

3. To exempt the members of the 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 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 Study Team for remittance as well as utilization of funds introduced into Malaysia from Japan in connection with the 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 Study Team with medical services when needed but the expenses will be chargeable to the members of the Study Team.

8. To provide the Study Team with available data, maps and information necessary for the execution of the Study.

9. 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.

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10. To appoint counterpart personnel to the Study Team during the Study period.

11. To provide the Study Team with suitable office space, with clerical service and necessary office equipments in Kuala Lumpur and at the two selected river mouth locations.

12. To provide the Study Team with adequate means of local transport for official travel only.

13. To indemnify any members of the 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.

14. To nominate the Drainage and Irrigation Department to act as the main counterpart agency for the Study and the Economic Planning Unit as the main coordinating body in relation to other relevant Governmental and non-Governmental organisations.

VIII. UNDERTAKINGS OF JICA

In order to conduct the Study, JICA shall take the following measures:

(1) To dispatch, at its own expense, the Study Team to Malaysia.

(2) To pursue technology transfer to the Malaysian counterpart personnel in the course of the Study.

IX. CONSULTATION

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

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APPENDIX

TENTATIVE SCHEDULE

MONTH / ITEM	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
STUDY IN MALALYSIA		═	═	═	═	═	═	═	═	═					═	═	═	═	═	═	═	═	═	═				═		
STUDY IN JAPAN	═									═	═	═	═	═										═	═	═	═			
REORT		△ IC/R				△ P/R (1)				△ P/R (2)					△ IT/R					△ P/R (3)				△ P/R (4)			△ DF/R		△ F/R

(REMARKS) IC/R : Inception Report P/R : Progress Report IT/R : Interim Report

DF/R : Draft Final Report F/R : Final Report

MINUTES OF MEETING

ON

SCOPE OF WORKS

FOR

THE NATIONAL RIVER MOUTHS STUDY

AGREED UPON BETWEEN

THE ECONOMIC PLANNING UNIT

OF

THE PRIME MINISTER'S DEPARTMENT

ON BEHALF OF

THE GOVERNMENT OF MALAYSIA

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

Kuala Lumpur,
27 March 1991

MS. LIN MUI KIANG
FOR DIRECTOR GENERAL,
ECONOMIC PLANNING UNIT,
PRIME MINISTER'S DEPARTMENT,
on behalf of
THE GOVERNMENT OF MALAYSIA.

MR. KOJI NUKAZAWA
LEADER,
JICA PRELIMINARY SURVEY TEAM
on behalf of
JAPAN INTERNATIONAL
COOPERATION AGENCY.

THE NATIONAL RIVER MOUTHS STUDY

Minutes of the Steering Committee Meeting held on 26 March 1991 in EPU, KL

1. Objective

The meeting was convened to discuss the Scope of Works for the National River Mouths Study.

2. Attendance

The list of attendance is as shown in Annex I.

3. Opening Remarks by Chairperson

Ms. Lin Mui Kiang, the Chairperson of the Steering Committee, welcomed the members of the JICA Preliminary Survey Team, the representatives of Embassy of Japan, and JICA Malaysia Office, and the members of the Steering Committee. She said that the objective of the meeting was to discuss the scope of works for the National River Mouths Study.

4. Opening Remarks by the Leader of JICA Preliminary Survey Team

Mr. Koji Nukazawa Leader, of JICA Préliminary Survey Team, in his opening remarks thanked the Malaysian side for the cooperation and assistance rendered to the Survey Team. He mentioned that his team members have made a field survey along the coastlines of Malaysia and noted that sediment discharge is a major cause of the river mouth problem in the country. He hoped that the study would contribute towards solving the river mouth problems.

5. Briefing by Chairman of Technical Committee

Ir. Joseph Yeoh, Chairman of the Technical Committee, then briefed the Steering Committee on the Technical Committee

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meeting held on 25 March 1991 at DID Headquarters. The issues which were discussed during the Technical Committee Meeting and agreed upon by the Steering Committee are as follows:

5.1 The Meeting agreed that feasibility study under the Phase II study period should be provided for two (2) selected river mouths, preferably one for river mouth located in muddy coastline and the other one located in sandy coastline. The two sites for the river mouth feasibility will be determined in consultation between the Study Team and the Malaysian Government. However the JICA Mission pointed out that feasibility study for muddy river will have some difficulties in view of the "state of arts" available at this stage.

The Meeting agreed that the coverage of the river mouth study will be about 100 river mouths during the questionnaire stage and about 80 during the Master Plan stage.

5.2 Regarding JICA's request to use DID existing facilities, the meeting agreed that the Study Team can make use of DID's Research Branch facilities at DID Ampang to carry out the physical model testings for the analysis of the river mouth problems. Material testings can also be undertaken at the Research Branch provided they are not excessive and beyond the capacity of DID Ampang. For those material testings that could not be carried out at the DID Research Branch, the Study Team will have them tested, using non-governmental facilities.

5.3 The Malaysian side requested the Study Team to evaluate whether the existing water sampling data/records collected from the river systems, can be used as a monitoring tool to monitor river mouth problem. In addition, the Study Team is also requested to make appropriate recommendations on how such information can be use for the monitoring and evaluation of the river mouth problems.

5.4 The meeting noted that institutional and legal aspects are

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essential components in addressing some of the river mouth problems. The JICA Mission explained that such issues are generally the decisions of the Malaysian Government. However, for the purpose of the Study, a general assessment of institutional and legal requirements will be carried out during the Phase I Master Plan stage. For the feasibility stage for the two selected river mouths, a more detailed coverage including the recommendations on the appropriate institutional requirements and legal aspects will be provided

5.5 The meeting discussed the environmental impact assessment (EIA) requirement for the study and agreed that it should comply with the guidelines prepared by DOE. At the master plan level, a matrix will be prepared. At the feasibility study stage for the two selected river mouths, only a preliminary EIA will be required. The Study Team will engage a local Consultant to cover this portion of the study. In addition to this study, a study on the water quality and biological diversity of marine lifeform will also be carried out for the two selected river mouths.

5.6 In order to facilitate the management and retrieval of information, there is a need to establish as part of the study, a micro computer database system containing all relevant information on the river mouths. This database is necessary to provide quick and reliable information for DID to monitor river mouth situations and to undertake future follow-up actions. The JICA Mission agreed to assist towards the establishment of a simple database management and retrieval systems.

5.7 With regards to technology transfer, the Malaysian side emphasized on the need to equip the Malaysian counterpart staff with the necessary skills and knowledge so as to enable them to carry out similar analysis in other river mouth studies. Counterpart training should preferably include training in the use of the computer model analyses that are used by the Study Team. The JICA Mission took note of the Malaysian request that counterpart training for the purpose of technology transfer be provided for two Malaysian

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personnels per year.

5.8 The JICA Mission was requested to provide certain equipments that are essential for the smooth implementation of the Study. The equipments are listed in Annex 2. The JICA Mission took note of this request.

5.9 For the JICA's request for reports and publications necessary for the study, the Malaysian side pointed out that all published documents can be readily made available to the study team without any restrictions. However for the case of classified documents and restricted maps, the Malaysian side requested that the study team only make references on such reports/maps during the study in Malaysia.

6.0 The Chairperson thanked JICA Mission for its assistance and expressed the hope that the Study will proceed smoothly and in accordance with the schedule. She then thanked all members present for their participation in the meeting.

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ANNEX I

ATTENDANCE AT THE STEERING COMMITTEE MEETING

STUDY TEAM

1.	Mr. Koji NUKAZAWA	-	Team Leader
2.	Mr. Hidetomi OI	-	Member
3.	Mr. Hiroaki SATO	-	Member
4.	Mr. Atsushi OMATA	-	Member
5.	Mr. Eiichiro CHO	-	Member
6.	Mr. Kazuo MIBAYASHI	-	Member.

JICA MALAYSIA

1. Mr. Yasuo SAKAI

EMBASSY OF JAPAN

1. Mr. Shunichi HAMADA

MALAYSIAN SIDE

1.	Ms. Lin Mui Kiang	-	Economic Planning Unit (Chairperson)
2.	Mr. Abdul Latib Markom	-	Economic Planning Unit
3.	Mr. K. Thillainadarajan	-	Economic Planning Unit
4.	Ir. Bakhtiar Kendut	-	Economic Planning Unit
5.	Ms. Lim Peng Joo	-	Ministry of Agriculture

K.N

6.	Ir. Joseph Yeoh Hoh Hoh	-	Drainage and Irrigation Department
7.	Ir. Neo Tong Lee	-	Drainage and Irrigation Department
8.	Ir. Ng Chau Chen	-	Drainage and Irrigation Department
9.	Mr. Muhammad Abdul Basar Hj. Taji	-	Marine Department
10.	Mr. Tan Cheng Kiat	-	Department of Fisheries
11.	Mr. Muhamad Indra Ramin	-	Fisheries Development Authority of Malaysia
12.	Mr. Mohd. Firdawos Shaharuddin	-	Fisheries Development Authority of Malaysia
13.	Mr. Ahmad Kamarulnajuib Ibrahim	-	Department of Environment.
14.	Mr. Tutsutaro SUMI	-	Drainage and Irrigation Department

K.N

Annex 2

National River Mouth Study
List of Equipments

1. Geodimeter 412 positioning system

2. Pressure type wave meter with cable

3. Electromagnetic type current meter

4. Micro computer for data management and retrieval
   (model 80386)

5. A/D Converter for hydraulic measurement

6. Computer software:
   Data Collection and analysis (field data)
   Data measurement and analysis (laboratory data)

7. Photostat machine

8. Capacity type wave meter

9. Water level meter

10. Two (2) numbers of modem plus communication software

K.N

THE RESEARCH BRANCH

DEPARTMENT OF IRRIGATION AND DRAINAGE

MALAYSIA

MARCH 1990

THE RESEARCH BRANCH
DEPARTMENT OF IRRIGATION AND DRAINAGE
MALAYSIA

Introduction

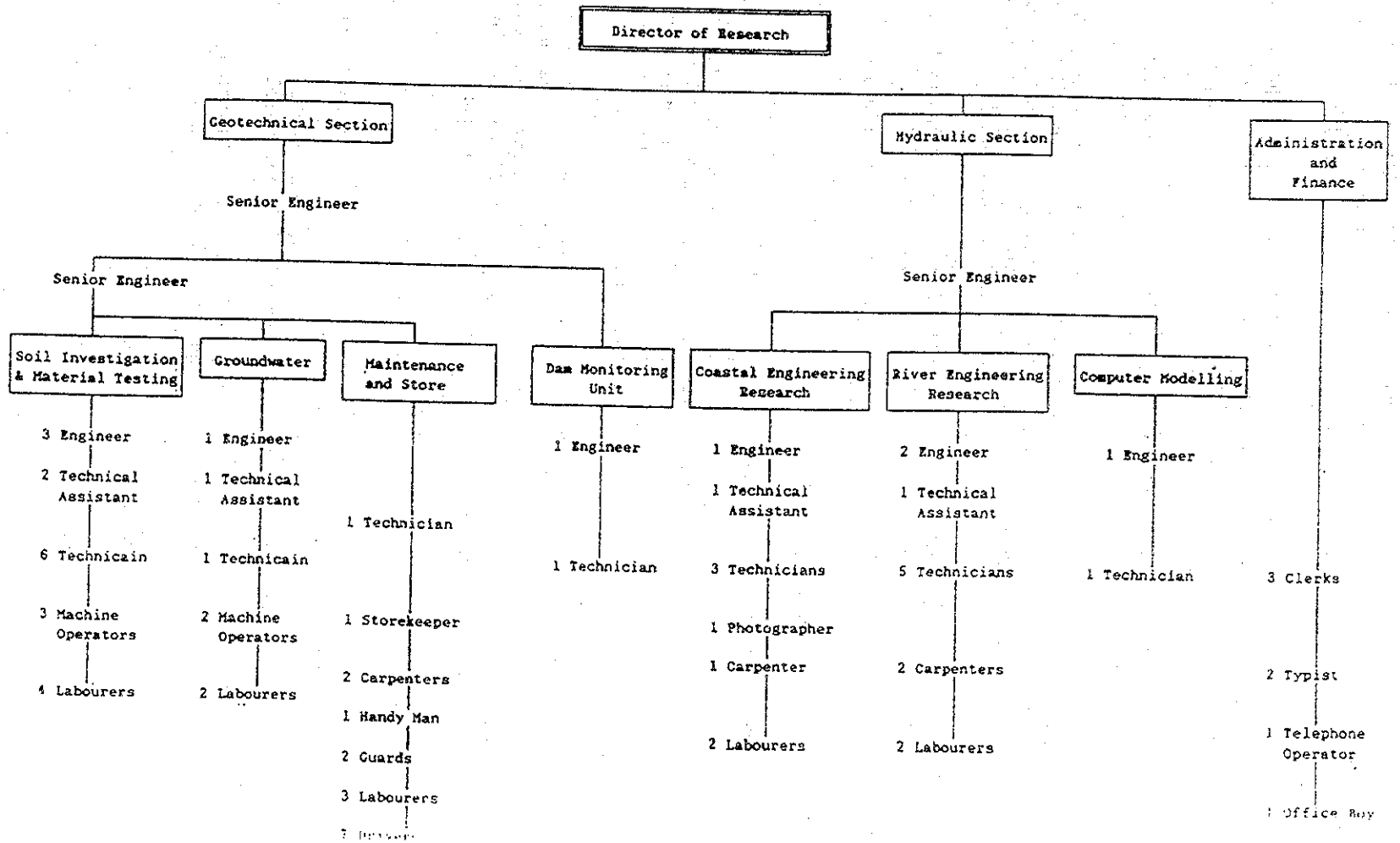
The Department of Irrigation and Drainage (DID), Malaysia was first formed in January 1932 under the Ministry of Agriculture. The Department provides engineering services in irrigation and drainage, river conservancy, flood mitigation, coastal engineering and hydrology, primarily to support agricultural development in the country. The activities of the Department include planning, design, construction, operation and maintenance of the above mentioned engineering works. Since its early days, research activities have played important role in the design and/or upgrading of design practices in the Department, particularly for hydraulic structures. The Department undertook its first hydraulic model study in 1935 for the design of the Ijok Headworks. The model was constructed in the open using water from a mining canal near Serendah. In 1936, proper hydraulics laboratory was constructed near Kuala Lumpur. A number of hydraulic model studies were undertaken in this laboratory until its destruction during the Second World War in 1941.

The present Research Center was constructed in 1951 and officially opened in 1953. Originally, it had three sections, namely hydraulic engineering, geotechnical engineering and hydrology. In 1972, the Hydrology section became a separate branch by itself and was moved to the Headquarters of DID. In 1975, the Research Center was further expanded with the construction of a coastal laboratory to carry out physical modelling of of coastal engineering problems, mainly for port layout planning. In 1980, a Groundwater Unit was added to carry out exploration and development of groundwater for agricultural use. In 1987, a Dam Monitoring Unit was set up in the Research Center to carry out the activities of dam instrumentation, processing of instrumentation data, dam safety inspection and all other matters related to dam engineering. Since 1988, the hydraulic section also started on the use of computer or numerical models for hydraulic and water resources engineering applications.

At present, the Research Center has a total staff strength of about 80 people which include 13 civil engineers, 5 technical assistants and 18 technicians. Its main activities can be classified into two areas, namely applied research and technical service support. The former is true of hydraulic and coastal engineering problems involving the use of physical or numerical models. The service support activities include soil investigations, material testing and groundwater exploration and development. The Dam Monitoring Unit has been planned as a specialist support unit to oversee and advise on all the problems encountered in the operation and maintenance of dams, inclusive of safety inspections.

The annual operating budget of the Research Center is about one million ringgit, about 85 % of which are for staff emoluments. In addition, most technical service support activities (eg. soil investigation and material testing) are directly funded by the client (usually the Project Office).

ORGÁNISATION CHART
RESEARCH BRANCH,
DEPARTMENT OF IRRIGATION AND DRAINAGE



THE RIVER ENGINEERING RESEARCH UNIT

A. OBJECTIVE AND MAIN ACTIVITIES

The objective of this unit is to provide research support services to the DID for the solution of hydraulic and river engineering problems in the country. The main activities include :

1. Basic data collection covering design of data collection program, field work, processing and interpretation of raw data.

2. Technical studies for the solution of specific river engineering problems such as river improvement works, siltation and erosion control, siting of pumphouses, revetments and groynes, river regime and sediment transport, bank stabilities, etc. Physical and mathematical models are the main tools for these studies.

3. Research and development of state-of-the-art technology for use in the technical analysis of river engineering problems.

B. FACILITIES FOR RIVER ENGINEERING RESEARCH

1. The River Engineering Laboratory was built in the 1950's. It comprised a reinforced concrete building measuring 100 ft. long by 70 ft wide. It was equipped with 4 units of pumps having a total rated capacity of 3.0 cusec. The pumping capacity is adequate for physical modelling studies of hydraulic structures.

2. The laboratory is equipped with two glass flumes, one of which has a fixed width of 2 ft. and is 39 ft. long whilst the other has an adjustable width of up to 3 ft. and is 92 ft. long. Both these flumes are, however, not adjustable vertically. The flumes are in very poor condition and have not been used for the past 20 years.

3. Equipments

	Type	Nos
1.	Mini-current- meter model OTT-C2	4
2.	Electric revolution counter for current- meter	2
3.	Small-propeller current-meter model Nixon complete with counter	1
4.	Electronic Total Station, Sokkisha Set 4 Distance range up to 1000 meter, accuracy 2 mm	1
4.	Survey Level- Wild	1
5.	Survey Theodolite	1
6.	Point-gauges	5

LIST OF PHYSICAL MODELLING STUDIES CARRIED OUT IN THE RESEARCH CENTER IN THE PAST 5 YEARS

Year	Title of project
1985	Semerak weir scale model testing
1985	Hydraulic model study of Jeniang transfer barrage
1985	Hydraulic model study of Timah Tasuh Dam spillway
1986	Hydraulic model study of Arau Dam spillway
1986	Calibration of guilliotine gate turnout and modified butterfly valved turnout
1987	Hydraulic model study of Simpang Kiri River flood retardation embankment
1987	Hydraulic model study of bank erosion of Terengganu River at Kuala Berang, Terengganu
1989	Hydraulic model study of Sg. Selangor Water Supply Intake using movable bed model.

THE COASTAL ENGINEERING RESEARCH UNIT

A. OBJECTIVE AND MAIN ACTIVITIES

The Coastal Engineering Research Unit is responsible for providing research support services (principally physical modelling) for planning and design of coastal engineering works undertaken by DID and other government agencies. Its activities include

1. Basic data acquisition covering design of data collection program, field work, processing and interpretation of raw data.

2. Planning and design of physical models for investigation of coastal engineering problems such as port layout, breakwater alignment, groynes, river mouth training works, siltation and erosion problems in estuaries and coastlines.

3. Construction of physical models and carrying out verification and production runs to determine optimum layout or engineering solution to a field problem.

B. FACILITIES FOR COASTAL ENGINEERING RESEARCH

1. The coastal engineering laboratory was completed in September, 1975 under the technical guidance of Delft Hydraulics, Netherlands. The laboratory has a covered area of about 3000 m_2 (45 x 44 meters) accommodating the wave basin, pumps and a wave generator. The pumps have a maximum combined capacity of 1 m^3/sec.

2. The wave generator consists of 8 uits of length of 5.5 m each, coupled in sections of 4 units each. Each section is supported at each end by rollers and can turn around a pivot boom over a maximum angle of 30 degrees. The wave generator can generate regular waves only. Other technical specifications of the wave generator are as follows :

Wave periods	0.5 to 3.0 seconds
Wave directions	30 degrees
Wave Height	0.15 meter (maximum)
Water depth	0.40 meter (maximum)
Wave generation	translatory motion only

3. The laboratory is primarily designed for fixed bed modeling of port layout, breakwater alignment and simplified river mouth studies.

4. Laboratory Equipments
   (a) 2 units wave height recorders with chart output
   (b) 1 unit electronic bed profiler Model PV-07 manufactured by Delft Hydraulics, suitable for depth measurement ranging 0.03 m to 1.08 m with accuracy of 0.2 mm.

PHYSICAL MODEL STUDIES OF COASTAL ENGINEERING PROBLEMS (SINCE 1975)

No.	Project	Year
1	Model study of Kuantan Fishing Port	1975
2.	Model study of propoese Semarak breakwaters	1982
3.	Model study of Kuala Besut Fishing Harbour	1983
4.	Model study on siltation problem at Cendering Fishing Harbour, Terengganu	1984
5.	Model study of escarpment protection at Sg. Burong, Kuala Selangor.	1985

THE COMPUTER MODELLING UNIT

A. OBJECTIVE AND MAIN ACTIVITIES

The objective of this unit is to develop, acquire, apply and train DID engineers on the application of computer models for the studies of hydraulic and water resources engineering problems. Its main activites are :

1. To acquire, develop and/or update computer models which have potential for frequent applications in hydraulic and water resources engineering studies.

2. To survey and evaluate models developed by private or other research institutions and to recommend suitable models for purpose - specific applications.

3. To train DID engineers on the use of computer models in hydraulic and water resources engineering studies.

4. Application of computer models on real-life problems.

5. To provide technical advisory support on problems encountered in the use of computer software for engineering applications.

B. FACILITIES

1. 4 Units of IBM PC/AT compatible microcomputers with maths co-processor, hard-disk and printers.

C. CURRENT PROJECTS

1. Application of DAMBRK for dam break studies of Batu, Macap, Repas and Labong Dams.

2. Determination of PMF floods and routing through reservoirs for Bukit Kwong, Labong dan Gopeng Dams. Studies involve rainfall-runoff modelling and reservoir routing by computer program.

3. Review of reservoir operation rules for Macap Dam.

4. Upgrading of HSFR program for unsteady flow routing.

5. Evaluation of commercially available computer software for one dimensional and two dimensional flow modelling.

6. Training of DID engineers on the use of HSFR, HEC-1, HEC-2, HEC-6 and Storage Function Model.

7. Assisting Western Johor Project on the development of real-time data acquisition system for improving the operation of the drainage and flood control systems.

SOIL INVESTIGATION AND MATERIAL TESTING UNIT

A. OBJECTIVE AND MAIN ACTIVITIES

The soil investigation and material testing unit provides technical service support for the design of engineering works by the Department. Its primary responsibilities are :

1. To carry out engineering soil investigation for determining geotechnical information required for the design of engineering works in DID. This includes planning of soil investigation program, mobilisation, quality control of field work, laboratory testing of soil samples and preparation of soil investigation report.

2. To carry out field investigations and desk studies for the solution specific geotechnical engineering problems such as slope stability of embankments, seepages in dams and structures, etc.

3. Testing of construction materials and engineering products to determine their design parameters and suitability for use in DID projects.

4. Laboratory tests on river water samples to determine sediment content.

5. Soil investigation, installation of piezometers and other monitoring equipment for the dams under DID.

B. FACILITIES

1 No. YBM drilling equipment capable of rock coring
3 No. portable motorised cat-head for wash boring.
2 No. Acker Drill
1 No. Dutch Cone Penetrometer
5 No. Hand Auger
3 No. Macintosh Probes
Soil laboratory for the commonly encountered soil tests.

PROJECTS UNDERTAKEN BY SOIL INVESTIGATION UNIT IN 1989

In 1989, the Soil Investigation Unit carry out investigations for 12 projects. The monetary value of these works (if undertaken by the private sector) is estimated at M$ 120,000. The material testing laboratory carried out suspended sediment analysis for about 5000 water samples.

Presently, the activities of the soil investigation unit are largely service in nature. There are plans to expand its role to geotechnical research or problem solving at a latter stage as the staff gained experience and expertise in geotechnical engineering through on-the-job training and postgraduate studies.

LIST OF PROJECTS UNDERTAKEN IN 1989

(1) Soil investigations and piezometer installations in Bukit Kwong Dam in Kelantan

(2) Soil investigations and piezometer installations in Labong Dam in Johor.

(3) Soil investigations and piezometer installations in Gopeng Dam in Perak.

(4) Soil investigations and piezometer installations in Air Kuning Dam in Agricultural Park, Shah Alam, Selangor

(5) Soil investigations and piezometer installations in Semberong Dam in Johor (continuation from 1988).

(6) Soil investigations for proposed Dam C in Agricultural Park, Shah Alam, Selangor.

(7) Soil investigations for reservoir area of proposed Dam C in Agricultural Park, Shah Alam, Selangor.

(8) Soil investigations for proposed Freshwater Fish Culture Pond in Bukit Diman, Terengganu.

(9) Soil investigations for the proposed Sg. Tiram drainage improvement scheme (continuation from 1988).

(10) Soil investigations for Sg. Klang (near Central Market bridge) for the Kuala Lumpur Flood Mitigation Project.

(11) Soil investigations for the Sg. Kangar Flood Mitigation Project.

(12) Soil investigations for the proposed rehabilitation of Sg. Manik Headworks, Teluk Intan, Perak.

GROUNDWATER UNIT

A. OBJECTIVE AND MAIN ACTIVITIES

The objectives of the Groundwater Unit are to carry out investigation, exploration and development of groundwater resources for agricultural uses. Its main activities are

1. To provide technical advisory services to the Department regarding the technical feasibility and economic viability of groundwater development projects.

2. To carry out field investigation to determine quantity of groundwater, safe yield and its suitability for irrigation use.

3. To construct production wells and monitor the long term performance of these wells.

4. To maintain a database of groundwater investigation findings for use in future planning of groundwater projects, preparation and updating of groundwater potential maps.

5. To carry out applied research activities to support the planning and design of groundwater development projects.

B. FACILITIES

(a) 2 units TONE Model TOP-50A truck mounted hydraulic rotary top head drive type drilling machine capable of drilling to a depth of up to 750 meters.

(b) 2 sets downhole geophysical loggers - SIE Model T450-E comprising SP/SPR, caliper, gamma and temperature logging systems.

(c) 2 sets test pumps for 6 and 10 inches boreholes suitable for discharges ranging from 2 to 50 liters/sec.

(d) 1 set portable chemical analysis kit (not serviceable)

(e) 1 set BISON earth resistivity Equipment comprising transmitter Model-2390T, receiver Model 2390R and Offset Wenner Switch Box Model 2365.

PROJECTS UNDERTAKEN BY GROUNDWATER UNIT (SINCE 1986)

1986 Groundwater investigation in Lubok Sireh, Perlis (total of 5 boreholes)

1986 Desk study of groundwater potential in Besut.

1986 Development and pump tests of groundwater wells in Padang Melangit and Mata Air, Perlis

1987 Pump test on selected wells in Perlis IADP

1987 Prelimiminary groundwater potential investigation using geoelectrical resisitivity method in proposed Fisheries project at Sebatu, Melaka.

1987 Construction and pumping tests of 3 exploratory wells in Pasir Mas, Kelantan

1987 Preliminary groundwater study using geoelectrical resistivity method in selected areas of Bagan Datoh, Perak.

1988 Desk study on groundwater potential for proposed prawn project in Langkawi Island.

1988 Pump test on exploratory well in Pasir Mas, Kelantan

1988 Preliminary groundwater study using geoelectrical resistivity method for proposed Felcra schemes in Kemasin Semarak IADP.

1989 Resistivity survey on Air Kuning Dam in Agricultural Park, Malaysia.

1989 Resistivity survey and construction of 1 groundwater production well for National Tobacco Training Center, Pasir Puteh, Kelantan.

1989 Resistivity survey for Kg. Nyior Cabang, Kg. Mata Air and Bukit Tekoh in Pulau Langkawi, Kedah

DAM MONITORING UNIT

A. OBJECTIVE AND MAIN ACTIVITES

The Dam Monitoring Unit provides technical services for the proper operation, maintenance, surveillance and safety inspection of dams for the 14 dams under DID. The technical features of these dams are as in Table 1. The main activities of DMU are :

1. To maintain a database of technical information on the design, operation and maintenance of all DID dams.

2. To collect, process and analyse all necessary data, inclusive of time series data for the safety monitoring of dams

3. To undertake the planning and installation of monitoring equipments and measuring devices such as piezometer, inclinometers and other telltales for dam safety monitoring.

4. To carry out annual and periodic inspection of dams and prepare inspection reports

5. To liaise and oversee the services of specialists or consultants engaged for specific assignments in dam safety inspection or design of remedial measures.

6. To provide technical advisory services to the Department on all matters related to design and operation problems of dams.

7. To train dam operators on the latest practice of dam safety surveillance.

B. CURRENT PROJECTS

1. In May 1987,a consulting engineer firm was appointed to establish a Dam Monitoring Unit in DID and to provide on-the-job training to DID engineers on the monitoring, surveillance and safety inspection of selected dams. A total of 4 dams, namely Semberong, Macap, Old Repas, New Repas were inspected and reports prepared. Follow-up activities for these dam are in progress.

2. In November, 1989 the DMU team, assisted by a foreign technical advisor, completed the first inspection of Bukit Kwong Dam.

3. A Database has been established to keep all technical record and instrumentation data of all dams under DID.

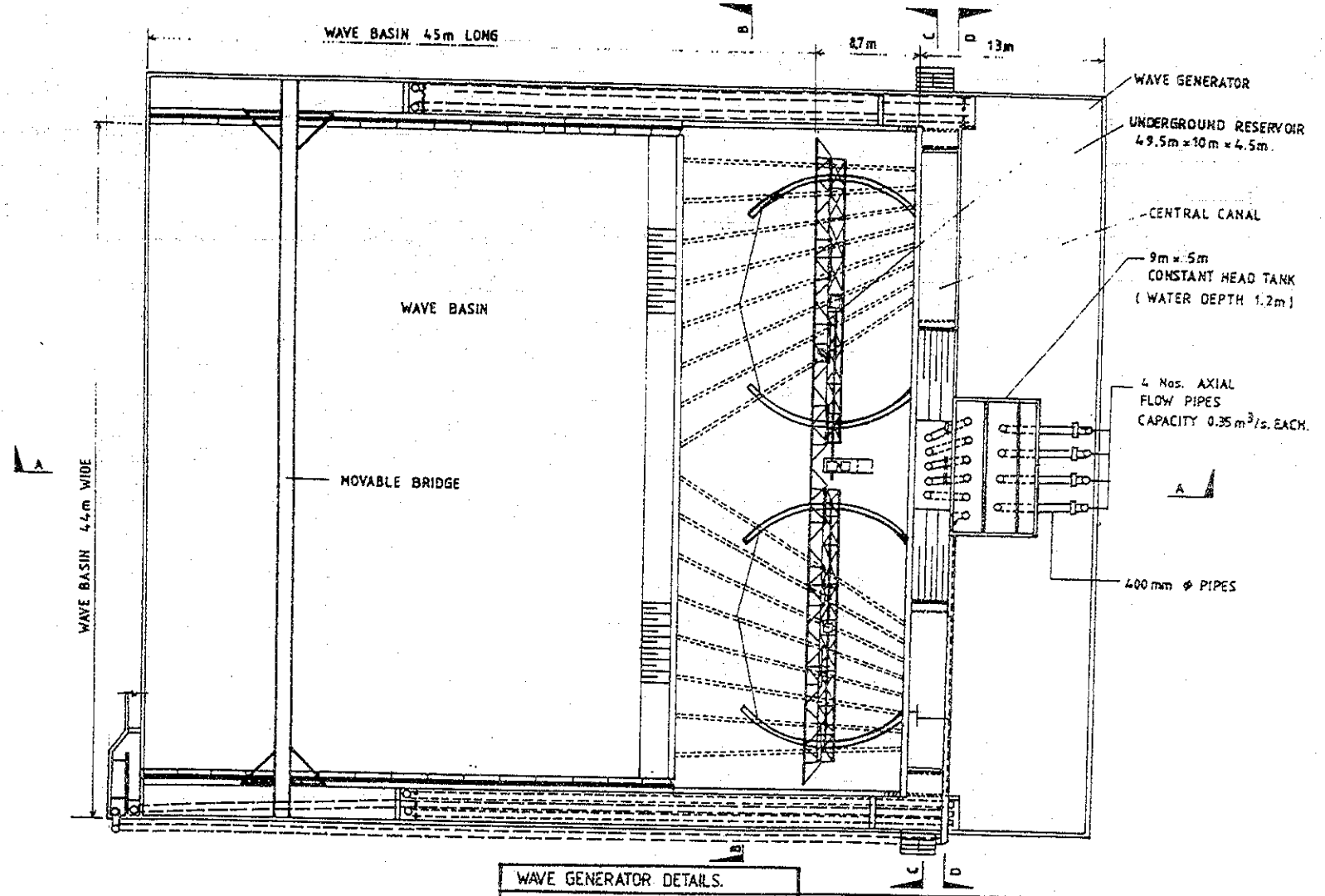
4. In 1990, there are plans to carry out first inspection of two other dams, namely Labong and Gopeng.

5. Work is in progress on the design of rehabilitation works for sG. Air Kuning Dam in the Agricultural Park, Shah Alam, Selangor.

TABLE 1 LIST OF DID DAMS

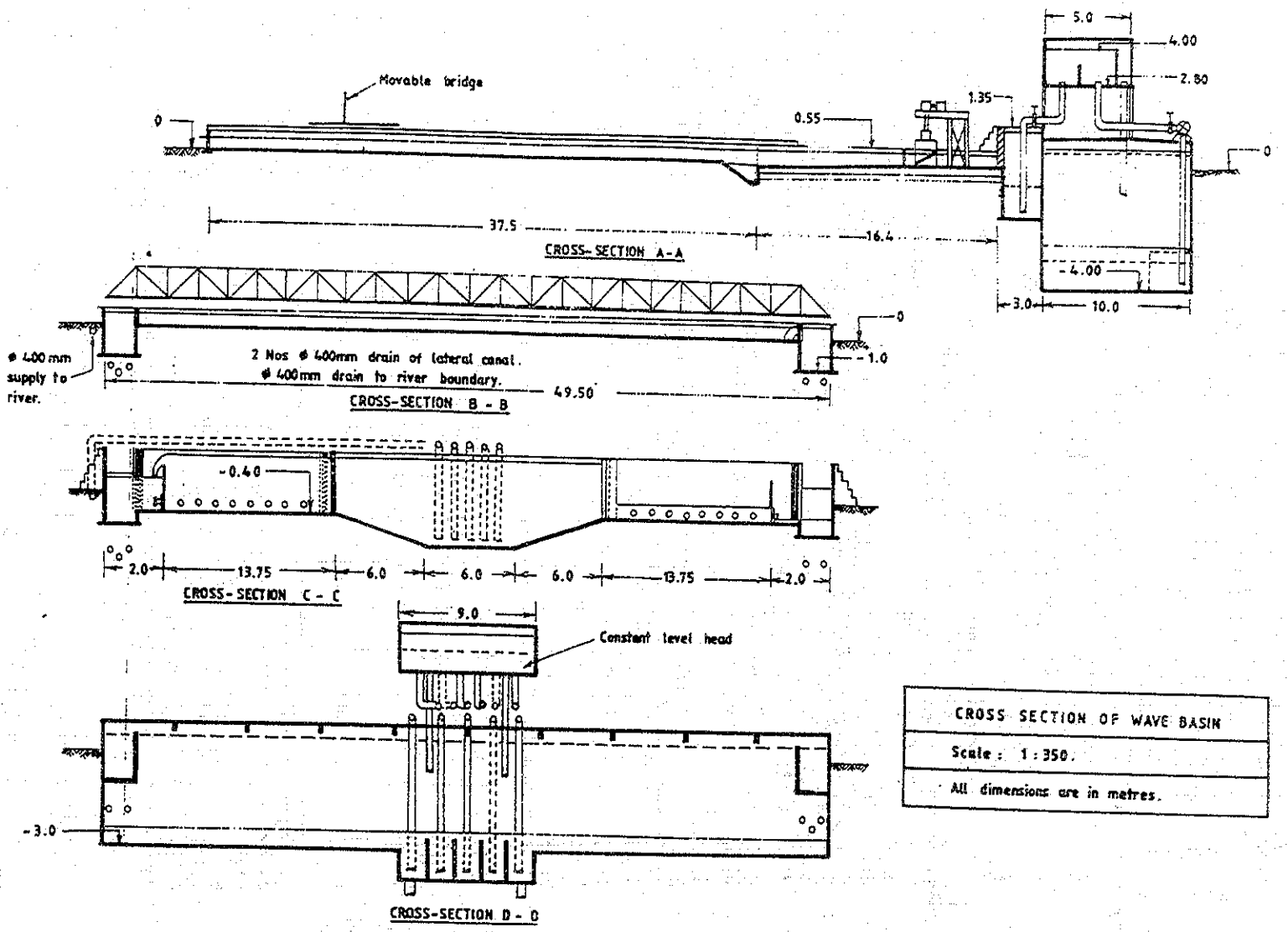
NAME OF DAM	LOCATION/ STATE	TYPE OF DAM	HEIGHT (m)	YEAR OF COMPLETION	RESERVOIR CAPACITY (Mil.cum)	CLASSIFICATION	
						SIZE	HAZARD POTENTIAL
1.TIMAH TASOH *	PERLIS	E	13.5	UNDER CONST.	38.0	INTERMEDIATE	HIGH
2.PADANG SAGA	KEDAH	E	8.3	1964	0.2	SMALL	SIGNIFICANT
3.BUKIT KWONG +	KELANTAN	E	7.7	1979	14.3	INTERMEDIATE	HIGH
4.BUKIT MERAH	PERAK	E	9.1	1906	93.0	LARGE	HIGH
5.GOPENG +	PERAK	E	9.0	1961	0.0	SMALL	HIGH
6.REPAS LAMA +	PAHANG	E	13.4	1925	0.0	INTERMEDIATE	HIGH
7.REPAS BARU +	PAHANG	E	17.0	1963	0.4	INTERMEDIATE	HIGH
8.BATU	K.LUMPUR	E	44.0	1986	36.0	LARGE	HIGH
9.PONTIAN	PAHANG	E	15.5	1985	40.0	LARGE	SIGNIFICANT
10.ANAK ENDAU	PAHANG	E	18.0	1985	38.0	LARGE	HIGH
11.LABONG	JOHOR	E	9.3	1949	12.8	INTERMEDIATE	SIGNIFICANT
12.BEKOK *	JOHOR	E	15.0	UNDER CONST.	125.0	INTERMEDIATE	SIGNIFICANT
13.SEMBERONG	JOHOR	E	11.0	1984	52.0	INTERMEDIATE	HIGH
14.MACHAP	JOHOR	E	11.5	1982	30.6	INTERMEDIATE	HIGH

* = UNDER CONSTRUCTION
+ = SILT RETENTION DAM
E = EARTH



WAVE BASIN OF DID COASTAL LABORATORY
Scale 1:350 0 5 10

WAVE GENERATOR DETAILS.		
Wave Board - 2 × 22m.	Wave Period - 0.5s to 3.0s.	Maximum Discharge 0.2m³/s.
Wave Direction - ± 30°	Wave Height - Maximum 0.15m	
Wave Type - Translatory/Regular	Water Depth - Maximum 0.4m.	



CROSS SECTION OF WAVE BASIN
Scale : 1 : 350.
All dimensions are in metres.

附属資料5. 面談者リスト

1. 首相府経済計画局 (ECONOMIC PLANNING UNIT, PRIME MINISTER'S DEPARTMENT)
   - Ms. Lin Mui Kiang — Principal Assistant Director
   - Mr. K. Thillainidarajan — Principal Assistant Director
   - Mr. Abd. Latib Markom — Assistant Director
   - Mr. Baktiar Hj. Kendut — Engineer
2. 農業省 (MINISTRY OF AGRICULTURE)
   - Ms. Lim Peng Joo
   - Ms. Siti Zakian Aman — Senior Librarian
3. 排水灌漑局 (DRAINAGE AND IRRIGATION DEPARTMENT)
   - Ir. Joseph Yeoh Hoh Hoh — Assistant Director General (North)
   - Ir. Neo Tong Lee — Coastal Engineering
   - Ir. Ng Chau Chen — Planning & Policy Branch
   - Ir. Dr. Hie Kim Loy — Research Station
   - Mr. Tan Teow Soon — Research Station
   - Ir. Jamal bin Abdullah — Hydrological Application Unit, Hydrology Branch
   - Mr. Zainal
   - 須 見 徹太郎 — JICA専門家
   - 増 田 暁 範 — JICA専門家
4. 海洋局 (MARINE DEPARTMENT)
   - Mr. Muhammad Abdul Basar Hj. Taji
5. 水産局 (DEPARTMENT OF FISHERIES)
   - Mr. Tan Cheng Kiat
6. 水産開発公社 (FISHERIES DEVELOPMENT AUTHORITY OF MALAYSIA)
   - Mr. Muhamad Indra Ramin
   - Mr. Mohod. Firdawos Shaharuddin
7. 環境局 (DEPARTMENT OF ENVIRONMENT)
   - Mr. Ahmad Kararulnajuib Ibrahim
8. 地質調査局 (GROLOGICAL SURVEY DEPARTMENT)
   - Mr. Shin Yeoh Khoon — Director

9. 森林局 (FOREST DEPARTMENT)

- Mr. Masran B. MD. Saiieh
- Mr. Yong Teng Koon

10. リモートセンシングセンター (MALAYSIAN CENTRE FOR REMOTE SENSING)

- Mr. Nik Nasruddin Mahamood　　Director

11. 日本大使館

- 濱田俊一　　二等書記官

12. JICAマレイシア事務所

- 小泉純作　　所長
- 湊　芳郎　　次長
- 酒井康夫　　所員

DATA TO BE COLLECTED/CONFIRMED

No.	Data/Item	Priority	Agency/Year	Collected/Confirmed	Remarks
1	District-wise Population/ Rural, Urban, Total	A	Department of Statistics	Yearbook of Statistics 1989 pp.3-6	Rural and urban are not distinguished
2	Sixth Malaysia Plan	A	Ecinomic Planning Unit		release June, 1991
3	Deigt Statistics (Malaysia)	A	Department of Statistics	Not confirmed	
4	Yearbook of Statistics	A	Department of Statistics	Collected	
5	Statistics Handbook	A	Department of Statistics	Collected	
6	Information Malaysia	A	Berita Publishing SDN. BHD.	Collected	
7	Peninsular Malaysia Statistical Bulletin	A	Department of Statistics	Confirmed	Monthly
8	Annual Statistical Bulletin, Sarawak 1989	A	Department of Statistics	Collected/Collected for Sabah also	Annual Bulletin of Statistics Sabah
9	Economic Report	A	Ministry of Finance	Collected 1990/91	
10	Peninsular Malaysia Monthly and Annual Statistics of External Trade	A	Department of Statistics	Not for Peninsular Malaysia	

A : During stay of Preliminary Survey Team B : Sending Information to Japan C : Up to Start of Study

DATA TO BE COLLECTED/CONFIRMED

No.	Data/Item	Priority	Agency/Year	Collected/Confirmed	Remarks
11	Malaysia External Trade Statistics 1989	A	Department of Statistics	Collected	
12	Sarawak Annual External Trade Statistics	B	Department of Statistics	Statistics of External Trade Sarawak 1989	
13	National Coastal Erosion Study	A	Drainage and Irrigation Department	Collected	
14	Environmental Design Conditions Study for the Peninsular Malaysia(Offshore) Gas Project	A	Drainage and Irrigation Department	No	DID Library 200 km offshore
15	Oceanographic Observations Near Lat. 4 30' N and Long. 103 30' E	A	Drainage and Irrigation Department		
16	Final Report of a One-Month Expert Mission	B	Drainage and Irrigation Department		
17	Coastal Resources of East Coast, Peninsular Malaysia	A	University of Science, Malaysia	Collected	DID Library
18	Report on Mission to Malaysia by ESCAP Expert in Dredging	A	Drainage and Irrigation Department	Collected	DID Library

DATA TO BE COLLECTED/CONFIRMED

No.	Data/Item	Priority	Agency/Year	Collected/Confirmed	Remarks
19	Kelatan River Basin Study	A	Drainage and Irrigation Department	Collected Main Report No.1-6	DID Library
20	Kelatan Minor Ports Study	B	Drainage and Irrigation Department	General Report II Part 1 vol.2 Part II	DID Library
21	Kemasin-Semerak Integrated Rural Development Project, Feasibility Study	C	Drainage and Irrigation Department	Vol.1 Main Report	DID Library
22	Design Report on Pengkalan Datu, Sg. Gali and Sg. Kemasin Seaworks	A	Drainage and Irrigation Department		DID Library
23	Design Report on Sg. Semerak Seaworks	A	Drainage and Irrigation Department	Vol. 1	DID Library
24	Golok River Basin Development Study	B	Drainage and Irrigation Department		
25	Terengganu River Basin Study	B	Drainage and Irrigation Department	Vol.1 General Report	DID Library
26	Terengganu Coastal Region Study	A	Drainage and Irrigation Department	Main Report	DID Library
27	Dulang Oil Field Development Project -- Environmental Design Criteria Study	C	Drainage and Irrigation Department	No	

DATA TO BE COLLECTED/CONFIRMED

No.	Data/Item	Priority	Agency/Year	Collected/Confirmed	Remarks
28	Besut Fishing Port Investigation	B	Drainage and Irrigation Department	Kuala Besut Fishing Port Model Study	DID Library
29	Besut Flood Mitigation Project, Feasibility Study	A	Drainage and Irrigation Department	Vol.1 Main Report Vol.3 EIA	DID Library
30	Tanjung Berhala Harbour, Hydraulic Investigation Final Report	A	Drainage and Irrigation Department	Collected	
31	Fishing Port Kuntan, Preliminary Design, General Report	C	Drainage and Irrigation Department		
32	Perlis Master Plan Study	B	Drainage and Irrigation Department		
33	Preliminary Environmental Impact Assessment for Petronas Second Refinery Project, Melaka, Final Report	C	National University Malaysia		
34	Environmental Profile of South Johor, South Johor Coastal Resources Management Project	A	Drainage and Irrigation Department	No	Not yet completed

DATA TO BE COLLECTED/CONFIRMED

No.	Data/Item	Priority	Agency/Year	Collected/Confirmed	Remarks
35	Effects of training Walls on Adjacent Beaches, Kuala Baram, Sarawak	A	Drainage and Irrigation Department	No	
36	Studies of Bar Deepening, Kuala Baram, Sarawak	A	Drainage and Irrigation Department	Collected	DID Library
37	Master Plan for Development of Sabah Port Expansion	B	Drainage and Irrigation Department		
38	Sector-wise Government Budget	A	Ministry of Finance		
39	Government Organisation for the Implementation of the Project	A	Economic Planning Unit, Prime Minister's Department	Collected	EPU, Ministry of Agriculture, DID
40	List of Available Topographical Map/Scale, Location, Year of Survey	A	Department of Survey & Mapping		
41	List of Available Land Use Map/Scale, Location, Year of Survey	A	Ministry of Agriculture	Collected	Ministry of Agriculture Library
42	List of Available Soil Map/Scale, Location, Year of Survey	A	Ministry of Agriculture	Collected	Ministry of Agriculture Library

DATA TO BE COLLECTED/CONFIRMED

No.	Data/Item	Priority	Agency/Year	Collected/Confirmed	Remarks
43	List of Available Geological Map/Scale, Location, Year of Survey	A	Geological Survey Department	Collected	
44	List of Available Marine Chart/Scale, Location, Year of Survey	A	Motion Smith	Collected	
45	List of Available Aerial Photos/Scale, Location, Year of Survey	A	Department of Survey & Mapping	Collected	
46	List of Available Satellite Imageries/Scale, Location, Year of Survey	A	National Remote Sensing Center	Collected	
47	Meteorological Station/ Station Name, Altitude, Latitude, Longitude, Measuring Period	A	National Climate Data Center		
48	Daily Record, Monthly Record for Each Station/ Precipitaion, Min. & Max. Temperature, Humidity, Evaporation	C	National Climate Data Center	Monthly Records 1989 12 volumes	DID Library
49	Wind Record/Measuring Station Name, Measuring Period	A	Malaysian Meteorological Service		

DATA TO BE COLLECTED/CONFIRMED

No.	Data/Item	Priority	Agency/Year	Collected/Confirmed	Remarks
50	Gauging Site/Location, River Name, Catchment Area, Measuring Period	A	Drainage and Irrigation Department		DID has no permanent station
51	Daily Records, Monthly Records for Each Gauging Site	C	Drainage and Irrigation Department	Hydrological Data Rainfall & Evaporation Records 1981-1985	DID Library
52	Flood Discharge Record/ Date of Flood, Measuring Point, Discharge	A	Drainage and Irrigation Department	Hydrological Data Stream Flow & River Suspended Sediment Records 1981-1985	DID Library
53	Flood Damage Record/Date of Flood, Area of Inundation, Washed Area	A	Drainage and Irrigation Department	Collected	Flood Summary Peninsular Malaysia 1925-1988
54	Sediment Load Measurement Record/Suspended Load and Base Load	A	Drainage and Irrigation Department	Hydrological Data Stream Flow & River Suspended Sediment Records 1981-1985	DID Library
55	Tide Level Gauging Site/ Location, Measuring Period	A	Royal Malaysian Navy		
56	Tide around Each River Mouth/Velocity, Direction	A	Royal Malaysian Navy		
57	Publication of Predicted Tides	A	Department of Survey	Collected 1991 Vol.1&2	DID Library

DATA TO BE COLLECTED/CONFIRMED

No.	Data/Item	Priority	Agency/Year	Collected/Confirmed	Remarks
58	Deep-water Wave Information from Shipboard Observation/Location, Height, Period, Direction & Percentage Occurrence	A	National Climatic Data Center		
59	Nearshore Wave Information from Littoral Environment Observation Program/Location, Height, Period, Direction & Percentage Occurrence	A	LEO Program	Collected	4 sites for sample
60	Instrumented Wave Information/Location, Height, Period	A	Drainage and Irrigation Department		
61	Tidal Prism - Gauging/Location, Measuring Period	A	Drainage and Irrigation Department	No	
62	Operational Wind and Wave Conditions Offshore Sabah	A	Drainage and Irrigation Department	Collected	
63	Availability of Remote Sensing Survey Result in the Proposed River Mouths	A	National Remote Sensing Center		No Survey
64	Geological Survey Result in the Proposed River Mouths/Name of Project, Type of Survey	A	Geological Survey Department	Collected	

DATA TO BE COLLECTED/CONFIRMED

No.	Data/Item	Priority	Agency/Year	Collected/Confirmed	Remarks
65	Availability of Field Survey Equipment/Type, Specifications	A	Drainage and Irrigation Department		
66	Availability of Laboratory Equipment/Type, Specications, Number of Staff	A	Drainage and Irrigation Department		
67	Availability of River Course Longitudinal and Cross Sections/Name of river, Survey Area, Year of Survey	A	Drainage and Irrigation Department		
68	Availability of Hydrographic-Bathmetric Charts/Location, Year of Survey	A	Drainage and Irrigation Department		
69	Availability of Beach Profiling/Location, Year of Survey	A	Drainage and Irrigation Department		
70	Availability of Bottom Material Survey Result/ Location, Year of Survey	A	Drainage and Irrigation Department		
71	Appraisal of Existing or Past Flood Mitigation Projects	A	Drainage and Irrigation Department	Kota Bharu Flood Mitigation Scheme 1983 Vol.1 Executive Summary	DID Library

DATA TO BE COLLECTED/CONFIRMED

No.	Data/Item	Priority	Agency/Year	Collected/Confirmed	Remarks
72	Appraisal of Existing or Past River Mouth Improvement Projects	A	Drainage and Irrigation Department		
73	Annual Dredging Volume for Each River Mouth	A	Drainage and Irrigation Department		
74	A Handbook of Environmental Impact Assessment Guidelines	A	Department of Environment	No	Out of stock
75	Soil Conservation Strategy	A	Department of Environment		
76	District-Wise Deforestation Condition	A	Forestry Department		
77	Appraisal of Existing or Past Soil Conservation Project	B	Environment Department		
78	Vegetation Condition of Mangrove	A	Environment Department		
79	District-wise Road Network	A	Public Works Department	Road Maps of Peninsular Malaysia	
80	Number of Registered Vehicles by Type and District	B	Ministry of Transport		

DATA TO BE COLLECTED/CONFIRMED

No.	Data/Item	Priority	Agency/Year	Collected/Confirmed	Remarks
81	Transport Amount	C	Road Transport Department		
82	Aviation Network	C	Civil Aviation Department		
83	Civil Aviation Statistics /Aircraft Movement, Terminal Passengers, Freight and Mail	C	Civil Aviation Department		
84	District-wise Harbour/ Name, Location	B	Marine Department		
85	Number of Registered Vessels/Type, Capacity	B	Marine Department		
86	District-wise Fishery Product	C	Fisheries Department		
87	Port-wise Transport Amount/Freight,Passengers	B	Marine Department		
88	Crop-wise Harvested Area, Yield, Production for Each River Mouth Area	A	Agriculture Department		
89	Farm Gate Price of Agriculture Products	C	Agriculture Department	Collected	

DATA TO BE COLLECTED/CONFIRMED

No.	Data/Item	Priority	Agency/Year	Collected/Confirmed	Remarks
90	Flood Damage Record for Agriculture	A	Agriculture Department		
91	Availability of Local Consultants/Name of Consultants Comapnies, Speciality, Number of Satff, Experience	A	Drainage and Irrigation Department	Collected	
92	Hydraulic Model Laboratory/Equipment, Number of Staff, Experience of Model Analysis	A	Drainage and Irrigation Department		
93	Coastal Protection Works at Permatang Bakar Kapor and Gurney Drive, Penang	A	Drainage and Irrigation Department	Collected	DID Library

附属資料7. 収集資料リスト

(1) 一 般

Department of Statistics, Yearbook of Statistics 1989
Department of Statistics, Statistics Handboo 1989
Berita Publishing SDN. BHD., Information Malaysia
Department of Statistics(Sabah B.), Annual Bulletin of statistics SABAH 1989
Department of Statistics(Sarawak B.), Annual Statistical Bulletin Sarawak 1989
Department of Statistics(Sabah B.), Vital Statistics SABAH 1989
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Department of Statistics, Vital Statistics Peninsular Malaysia 1990
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Department of Statistics, Current Population Estimates Peninsular Malaysia 1989
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Department of Statistics, Abridges Life Tables Peninsular Malaysia 1981-1087
Department of Statistics, Quarterly Review of Malaysian Population Statistics
Department of statistics, The Labour Force Survey Report Malaysia 1987-1988

(2) 経 済

Ministry of Finance, Economic Report 1990/91
Department of Statistics, External Trade Summary, December 1990
Department of Statistics, Malaysia External Trade Statistics 1989 Imports Part 1-3
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Department of Statistics, Malaysia External Trade Statistics 1989
Department of Statistics(Sarawak B.), Statistics of External Trade Sarawak 1989 Tables and Exports Vol. I Part I
Department of Statistics(Sarawak B.), Statistics of External Trade Sarawak 1989 Re-exports Vol. I PartII
Department of Statistics(Sarawak B.), Statistics of External Trade Sarawak 1989 Summaries and Imports (Sections 0-5) Vol. II Part I
Department of Statistics(Sarawak B.), Statistics of External Trade Sarawak 1989 Imports (Section 6) Vol. II PartII
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Bank Negara Malaysia, Annual Report 1989

Bank Negara Malaysia, Monthly Statistical Bulletin, November 1990
Bank Negara Malaysia, Quarterly Bulletin, December 1990
Bank Negara Malaysia, Discussion Paper No.7 Monetary Influence on Malaysian Economic Activity: Evidence From the Single-Equation Approach
Bank Negara Malaysia, Discussion Paper No.8 Shipment factor for ASEAN: (1970-84) with particular reference to Mlaysia
Bank Negara Malaysia, Discussion Paper No.9 Open Market Operations As a Monetary Instrument: The Malaysian Experience
Department of Statistics, The Producer Price Index for Malaysia 1989
Department of Statistics, Consumer Price Index for Malaysia, January 1991
Department of Statistics, National Accounts Statistics 1987-1989
Department of Statistics, Balance of Payment Report 1987-1989

(3) 関連事業

Drainage and Irrigation Department, National Coastal Erosion Study, Phase II Feasibility Studies, Final Report Vol. I Jan. 1986
Penerbit Universiti Sains Malaysia, Costal Resources of East Cost Peninsular Malaysia
ESCAP Expert in dredging, Report on Mission to Malaysia, Jan. 1983, April 1984, and Dec. 1983
Drainage and Irrigation Department, The Kelantan River Basin Study, Main Report Vol.1,
Drainage and Irrigation Department, Kelantan Minor Port Project, General Report 2, Jan. 1986, Marine Survey June 1985, Part 1, Vol.2, and Part 2 Dec. 1985
Drainage and Irrigation Department, Kemasin Semerak Integrated Rural Development Project Feasibilty Study, Vol.1 Main Report
Drainage and Irrigation Department, Kemasin Semerak IADP: Design Report of Semerak Seaworks, Vol.1
Drainage and Irrigation Department, Tregganu River Basin Study Water Resources of the Basin: Vol.1 Genreal Report
Drainage and Irrigation Department, Tregganu Coastal Region Study Draft Final Report: Vol.1 Main Report
Drainage and Irrigation Department, Kuala Besut Fishing Port Model Study - Technical Report No.39
Drainage and Irrigation Department, Besut Flood Mitigation Project Final Report Vol.1 Main Report, Vol.3 Environmental Impact Analysis
Drainage and Irrigation Department, Tanjong Berhala Harbour Hydraulic Investigations Final Report, Sep. 1982
Drainage and Irrigation Department, Kuala Baram Investigation Studies of Bar Deepning
Drainage and Irrigation Department, Feasibility Study and Detailed Designe of

Coastal Protection Works at Peratang Barker Kapor and Gurney Drive, Penang
Drainage and Irrigation Department, Effects of Training Walls on Adjacent Beaches Kuala Baram Sarawak

(4) 行政組織

Economic Planning Unit, Prime Minister's Department, 組織図
Ministry of Agriculture, 組織図
Drainage and Irrigation Department, 組織図

(5) 地 図

Ministry of Agriculture, List of Available Land Use Map
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Geological Survey Department, List of Available Geological Map/Scale, Location, Year of Survey
Motion Smith, List of Available Marine Chart
Department of Survey & Mapping, List of Available Aerial Photos/Scale, Location, Year of Survey
National Remote Sensing Center, List of Available Satellite Image/Scale, Location, Year of Survey

(6) 気象データ

National Climate Data Center, Monthly Abstract of Meteorological Observations January to December 1988 (12 Nos.)

(7) 水文データ

Drainage and Irrigation Department, Hydrological Data:Rainfall & Evaporation Records 1981-1985
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Drainage and Irrigation Department, Flood Summary Peninsular Malaysia 1925-1988
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Geological Survey Department, Young Quaternary Sediments in The Coastal Plain of Kelantan Peninsular Malaysia
Geological Survey Department, Young Quaternary Sediments in The Coastal Plain of Southern Perak Peninsular Malaysia

(9) 河川・海岸データ

Drainage and Irrigation Department, Kota Bharu Flood Mitigation Scheme 1983 Vol.1 Executive Summary

(10) 環　境

Environmental Protection Society Malaysia, Land Mismamagement Klang Valley's Woe

Department of Environment, Environmental Quality Report, 1988

(11) 道　路

Public Works Department, Road Maps of Peninsular Malaysia

(12) 農　業

Ministry of Agriculture, Farm Gate Price of Agriculture Products

Palm Oil Registration and Licensing Authority(PORLA), Palmoil uodate Vol: XI 2/91

PORLA, Palm Oil Statistics 1989

Department of Statistics, Handbook of Oil Palm, Cocoa, Coconut and Tea

Statistics Malaysia 1988

Department of Statistics, Rubber Statistics Handbook 1988

Department of Statistics, Monthly Rubber Statistics Malaysia December 1990

(13) 産　業

Department of Statistics, Special Release 2 for Building Works, February 1991

Department of Statistics, Monthly Manufacturing Statistics Malaysia, December 1990

Department of Statistics, Index of Industrial Production Malaysia January 1991

Department of Statistics, Industrial Surveys Construction, Manufacturing, Mining and Stone Quarrying 1988

Department of Statistics, Census of Professional and Institutional Establishment - Private sector - 1988

Department of statistics, Census of Selected service Industries 1988

(14) その他

Private Conusultants, Availability of Local Consultants/Name of Conultants Companies, Speciality, Number of staff, Experience

附属資料8. 基礎資料の賦存状況

(1) 地 形 図

Department of Survey and Mapping において、1 inch = 1 mile Map（縮尺 63,360）及び1：50,000地形図は、所定の書式で申請後、約1カ月のSecurity checkを受けなければならない。EPU等のマレイシア政府期間を通じての申請においても約3週間を要する見込みである。尚、Sabah及びSarawakについては、現地で申請する必要がある。1：50,000の地形図は、半島部ではまだ全域で完了していない。

航空写真は、飛行高度12,500 feetであり、縮尺1：40,000である。撮影は、1980、1981、1982、1983、1985、1986、1988、1989、1990年に実施されている。半島部位外については、現地で確認する必要がある。

地形図及び航空写真の索引図は、事務所に掲示されているのみで、一般に配布していない。

(2) 気象資料は、月間降雨量として整理されたものがDrainage and Irrigation Departmentより出版されている。これまでのタイトルを以下に示す：

Rainfall Records 1987 − 1959

Rainfall Records 1959 − 1965

Rainfall Records 1965 − 1970

Rainfall Records 1970 − 1975

Rainfall Records 1975 − 1980

Rainfall and Evaporation Records 1981 − 1985

最後の最新版に含まれる降雨観測所は、半島部で737の観測所、Sabah及びSarawakで197の観測所であり、更に蒸発散観測所は、半島部とSabah及びSarawakでそれぞれ26と22カ所である。全降雨観測所の日降雨記録は、Drainage and Irrigation Departmentのデータバンクに収められているため、調査に際して入手可能である。

気象資料は、Malaysian Meteorological ServiceよりMonthly Abstract of Mdteorological Observationsとして1年4カ月遅れで出版されている。31の主要観測所の記録は、平均気圧、気温、平均露点、平均湿度、平均雲量、日照時間、降雨量、蒸発散量、平均風速、最高風速及びその方向を含んでいる。120の測候所の記録は、月間平均気温、月間最高・最低気温、月間平均湿度、月間降水量、月間日最大降雨量・発生日、降雨日数、平均日蒸発散量及び平均日日照時間を含んでいる。133の降雨観測所の記録は、月間降水量、月間日最大降水量・発生日及び降雨日数を含んでいる。

(3) 波浪記録

Coastal Erosion Projectの波浪統計は、Drainage and Irrigation Departmentより入手出来

るが、その座標を付図８－１に示す。Littoral Enmvironment Observation Program (LEO)の沿岸波浪記録は、Drainage and Irrigation Departmentより入手できる。観測位置図を付図８－２に示す。観測は1988年６月から始められ、マレイシア語でデータ処理されている。マレイシア語の説明を以下に示す：

BAGI STESYEN－観測所No.

TARIKH	MASA	TEMPOH OMKAK	TINGGI OMBAK	SUDUT OMBA	JENIS OMBAK	HALAJU ANGIN	ARAH ANGIN	CERUN	LEBAR ZON
日付	時間	波周期	波高	接近角度	波のタイプ	風速	風向	海底勾配	砕波帯

HALAJU ARUS	PEWARNA	ARAH ARUS	ORIENTASI PANTAI	ARUS TEMPUR	JURING	ULASAN
沿岸流速	染料投入点	潮流	海岸方向	離岸流	カスプ	摘要

Purata bulanan － 月間平均

Maksimun bulanan － 月間最大

Minimun bulanan － 月間最小

NOTA：－ 註

JENIS OMBAK － 波形コード

0 = Tenang 静穏　1 = Utara 北　2 = Timur Laut 北東　3 = Timur 東　4 = Tenggara 南東

5 = Selatan 南　6 = Barat Daya 南西　7 = Barat 西　8 = Barat Laut 北西

ARAH ARUS － 潮流（コード）

1 = Tidak bergerak 移動無し　2 = Bergerak kekanan 右　3 = Bergerak kekiri 左

(4) 関連事業

関連事業の報告書は、Drainage and Irrigation Departmentの図書資料室から貸出で使用することが出来る。

(5) 洪水被害資料

Drainage and Irrigation DepartmentのHydrological Application Unit. Hydrology Branchにおいて近年の洪水被害記録が系統的に整理されている。ただし、産業別被害状況等の区分が行われていない。Ministry of Agricultureにも洪水による農業被害記録は整理されていない。

(6) 環　境

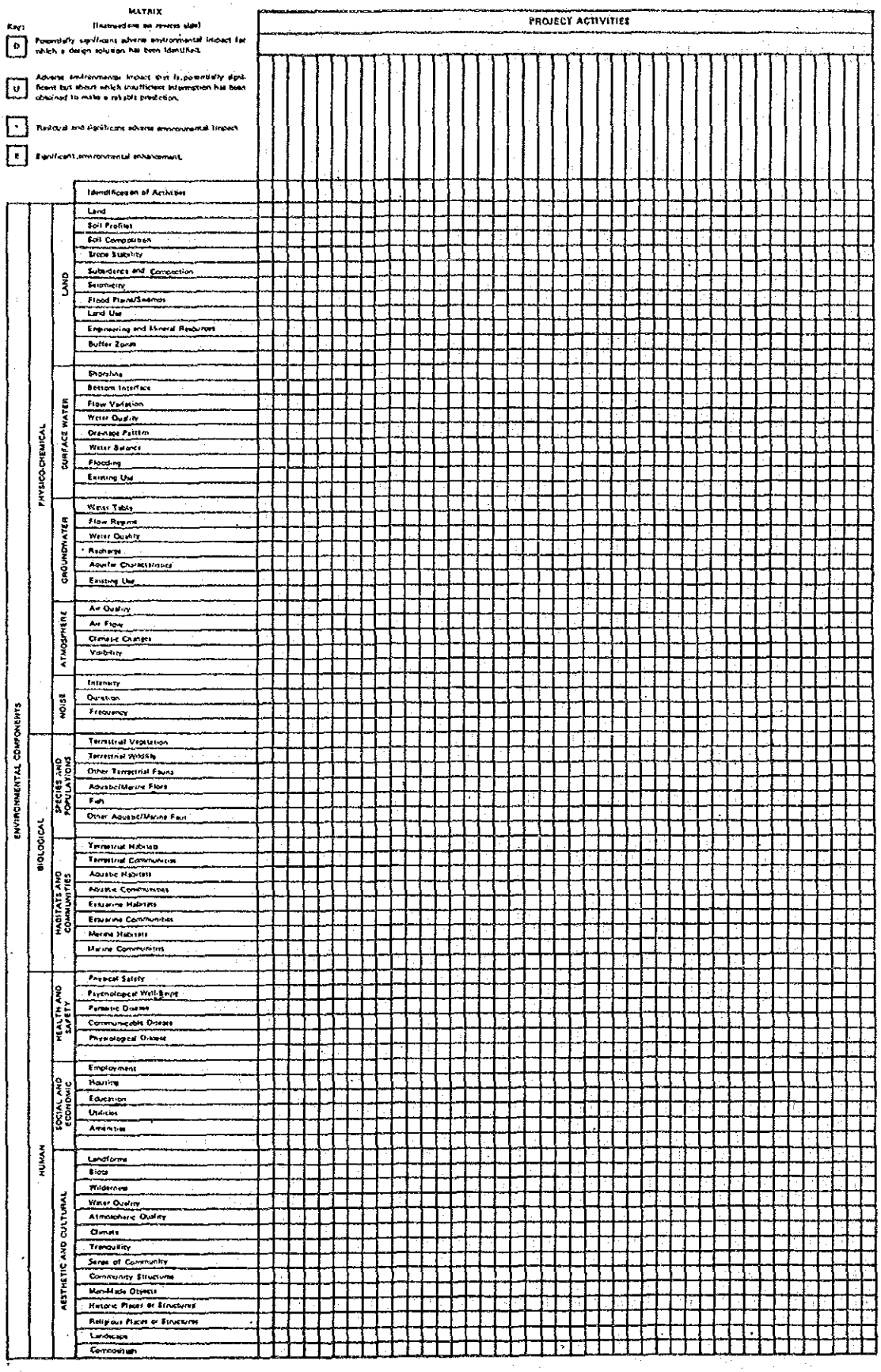
Department of Enviromentの図書資料室においては、環境影響評価報告書、その他の環境保全報告書の貸出が可能である。森林の環境保全に関しては、Forest Departmentの図書資料室、農業に関しては、Ministry of Agricultureの図書資料室が利用可能である。

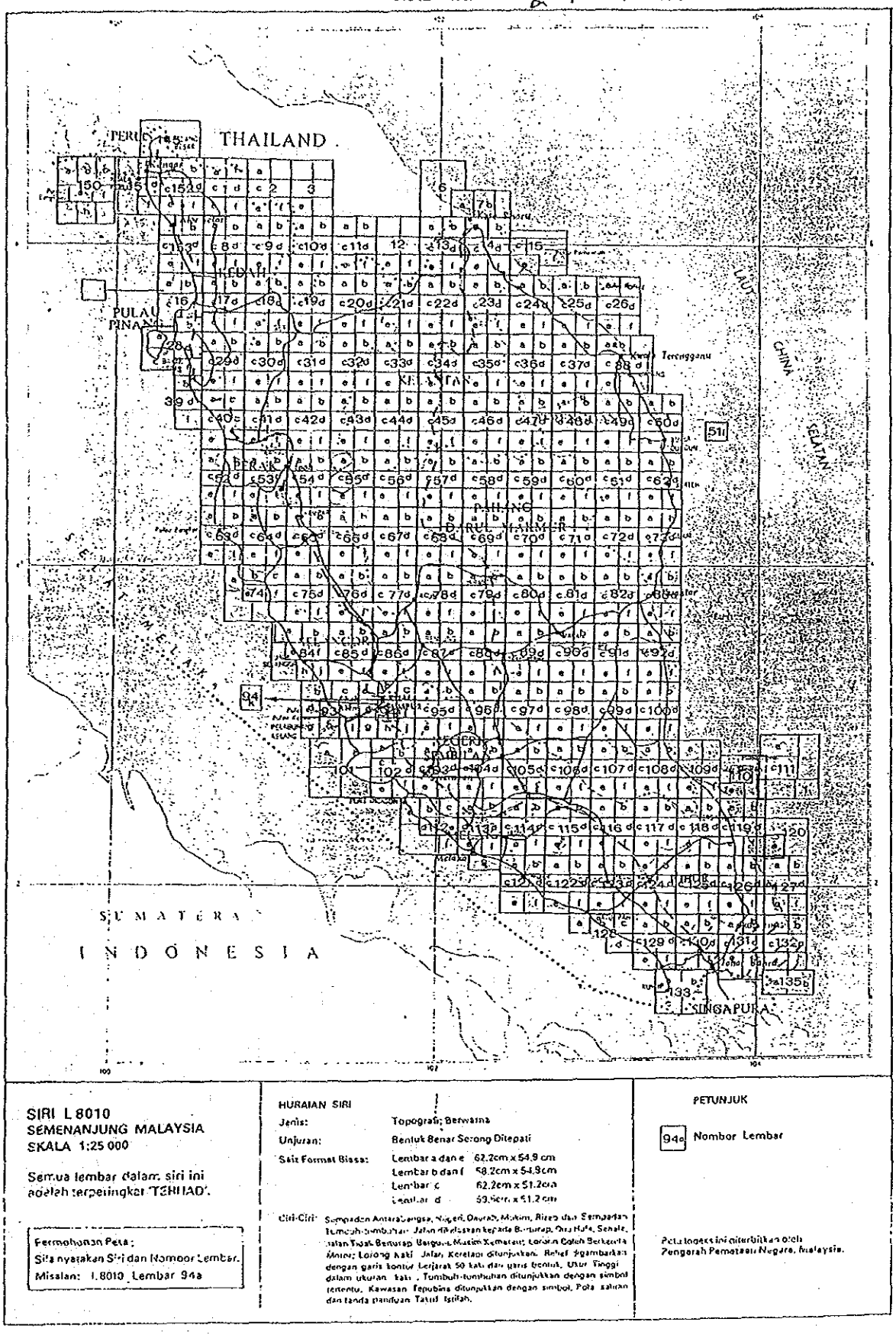
(7) リモートセンシング

Malaysian Centre for Remote Sensingには、1988年以降のデータのみが収集されている。画像処理設備は一式揃っていると考えられる。

附属資料9. 環境調査マトリックス

SPECIMEN COPY OF MATRIX





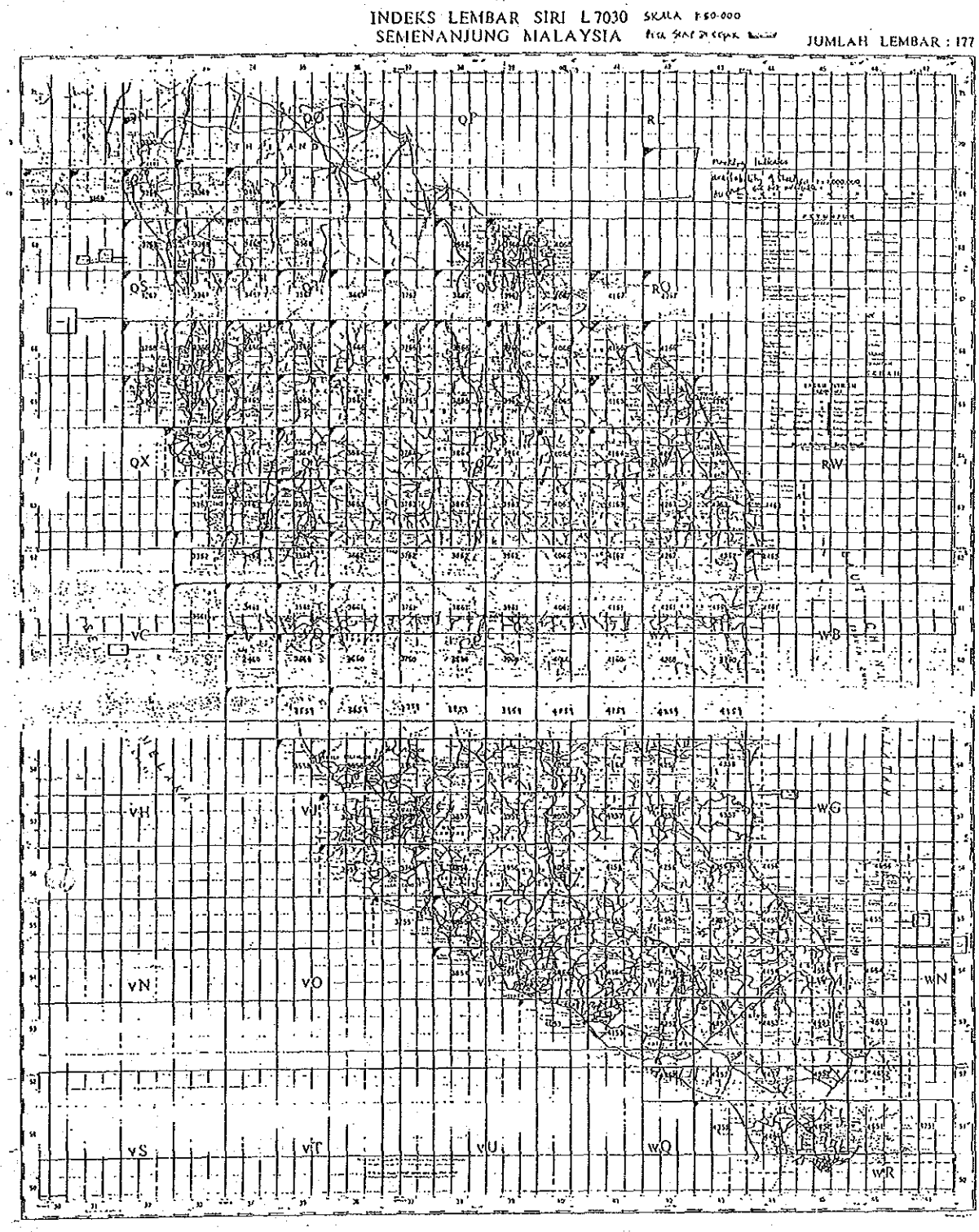
10.1 地形図 1inch = 1mile 及び 1：25,000 の索引図 － 半島部

Seksyen di Mana
Oktober 1977

附属資料 10. 地形図及び航空写真索引図

10. 1　地形図 1 inch = 1 mile 及び 1：25,000 の索引図 － 半島部

10. 2　地形図 1：50,000 の索引図 － 半島部



10.2 地形図 1：50,000 の索引図 － 半島部