

ータが相当程度含まれている。

図Ⅳ-5-1及び図Ⅳ-5-2に近年最大の1967年洪水の浸水区域及び浸水期間を示す。氾濫は下流平野部において、周辺の小河川（Golok川、Peng Batu川、Kemasin川、Semerak川）流域も含めた形で広がっており、特に左岸側は、タイとの国境になっているGolok川まで氾濫する。また、浸水期間も、長いところで3～4週間にわたっている。

写真Ⅳ-5に、最近10年の最大洪水である1979年洪水の浸水状況を示す。平野部全体に浸水域が広がり、道路が欠壊している。

一般の住家は高床式になっているものも目につくが、地面と同レベルの床になった家屋も多い。高床式は浸水からのがれるというより、通常時の湿気を避けるという意味合いが強いかもしれない。一般住民が浸水時にどのような行動をとるか聞いてみたが、ほとんどの住民は失うものをあまり持っていないので、わずかな家財道具を高いところに持ち上げる程度で、避難はしておらず、むしろお祭りさわぎになるということである。車については、一般住民はほとんど所有していないが、街中では相当目についた。浸水時には付近の微高地に退避するとのことである。

## 6. 治水計画及び治水対策の現状

(1) クラントラン川で、水系的に策定された治水計画の最初のもは、1977年にニュージーランドのENEXによる「The Kelantan River Basin Study」である。

この報告書はVolume 1～6及びAnnex 1～4からなり、かなり大部のものとなっているが、いわゆる治水計画に関するものはVolume 3「Flood Mitigation Projects」が中心となっている。Vol. 3によると、主要な治水施設として、上流最大の支川Galas川にDabongダム、2番目の支川Lebir川にJeram Panjangダムを提案（表Ⅳ-6-1）し、下流平野部には、上記2ダムの洪水調節を前提とすると、確率1/30程度になる10,000m<sup>3</sup>/S対応の堤防を、河口からKuala Kraiまで（約60km、約5kmピッチの横断面図を使用）提案している。なお、築堤より、ダムによる洪水調節を先行させるべきだとしている。しかし、この報告書に提案されたメイン施設であるDabongダムが、水没者が多い等の理由により頓坐し、具体化されたものは何もない状況である。

この報告書は、マスタープラン・レベルとしてはかなり詳細なものであるが、計画規模の妥当性、ダムと河道の機能分担の考え方等の理屈づけにおいて欠けたものがあり、計画の策定過程をマレーシア側に示してやる必要がある。

さらに、河道改修部分については、マレーシアのコンサルタントMINCOによる「Flood Mitigation Scheme」の報告書が1983年に作成されているが、確率1/10と1/50の洪水に対する河道の概略設計が行われているだけで、計画論的な整理はあまりなされていない。

次に、1982年の日本の援助による「マレーシア全国水源開発調査 No.8」がある。この調

表IV-6-1 ダム計画の概要 (ENEX 報告書, Vol. 3 より)

| ダム名<br>(河川名)                     | 支配面積<br>ギルマード橋<br>地点12,100km <sup>2</sup><br>に対する割合    | ダムタイプ                     | ダム高   | 左記ダム高<br>(洪水時の貯水<br>位) のときの容<br>量 (H~V図よ<br>り逆算) | ダムの治水効果  |
|----------------------------------|--|---------------------------|---|--|--|
| Dabong ダム<br>(Galas 川)           | 7,480km <sup>2</sup><br>@Dabons<br>(62%)               | 重力式コンクリ<br>ートダム<br>(坊主ダム) | 50m<br>(越流頂EL. 57)<br>(越流水深10m)                 | 約19億m <sup>3</sup>                               | ギルマード橋地<br>点に対し、1967<br>年洪水を、<br>16,350→12,150<br>m <sup>3</sup> /S とする。 |
| Jeram Panjang<br>ダム<br>(Lebir 川) | 2,480 km <sup>2</sup><br>@Tualang<br>Cableway<br>(20%) | アース・<br>フィルダム             | 50m<br>(洪水時の貯水<br>位 EL. 73<br>ダム天端標高<br>EL. 75) | 約13億m <sup>3</sup>                               | —————  |

査は、マレイシア全土を対象としたものであるし、また、水資源開発にウェイトを置いたものである。クランタン川の治水計画については、それだけ薄い内容となっているが、一応、F1~F3の三つの計画案を提示し、F2案(建設費 378×10.6M\$)を推せんとしている。

Alternative F1: Structural measures are provided by 2000 for the entire river system to protect 90% of people within the flood prone area.

Alternative F2: Structural and non-structural measures are provided by 2000 for densely populated areas to protect 50% of people within the flood prone area.

Alternative F3: Structural and non-structural measures are provided by 2000 so far as such measures are economically viable.

なお、超過確率は、年洪水被害が20,000M\$/km未満及び人口密度が500人/km未満の区間では1/20、その他の区間では1/50としている。ただし、人命の損失が記録されておれば、1/50は1/100にするのがよいとしている。

個別の計画になるが、同じJICAによる国際協力として電力サイド主体にLebirダムの計画策定が、F/Sレベルで進行中である。このLebirダムは前述のENEX報告にいうJeram Panjangダムのことと思われるが、ダム高60~70mのうち8~9m(14~20億m<sup>3</sup>)を使って洪水調節を考えているようである。すでに、物探4.2km、ボーリング21~22本(φ=785m)を実施し、Lebirダム流量~ギルマード橋地点流量~下流の被害の関係をつかんで治水の位置づけをして、12月頃にはLebirダムとしての治水計画の原案を策定し、昭和63年2月には中

間レポートの提出予定になっている。

いずれにしても、同じ日本の JICA による協力案件で、Lebir ダムと今回のクランタン川の治水計画のマスタープランづくりが併行して (Lebir ダムが先行して) 進むことになり、治水計画上の早急な調整が必要である。

## (2) 治水対策の現状

ハードな治水対策としては、局部的な対応が主体であり、湾曲部の水衝部を中心に手当てが実施されている。

### ・ Pasir Mas (コタバル上流の町、左岸側、水衝部)

2 km 弱の区間で、矢板と捨て石根固を組み合わせた護岸工事を行っており、完成に近づいている。

矢板には、サビ止めと称してモルタル吹き付けを行っている。

一部、矢板が河川側に倒れ込んでいるところがあり、事後対策を行っている。

### ・ 河口近くの右岸、水衝部

約 50 m の捨て石水制を約 10 基ほど施工し、ほぼ完成に近づいている。

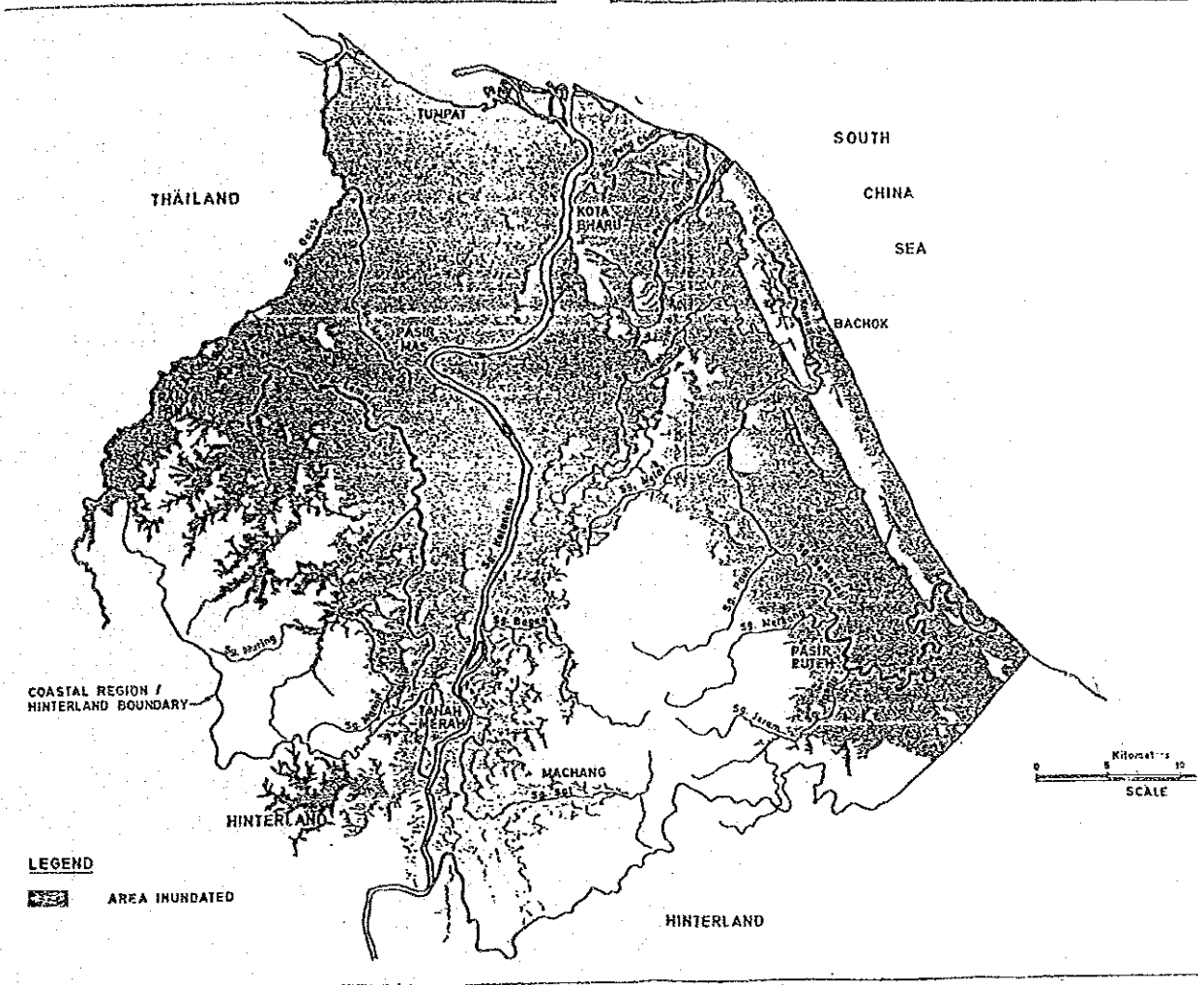
### ・ コタバル市街地の対岸 (左岸)

築堤 (詳細未確認)

ソフト的な対応としては、水位のテレメーター・システムが比較的整っており (図 IV-6-1)、Kuala Kerai 地点の水位等をクランタン州の DID がキャッチし、その情報をラジオを通じてコタバル市民に流すシステムになっているようである。一般住民の間にはテレビはほとんど普及していないものの、ラジオは普及しており、情報伝達手段としてのラジオの役割は大きい。

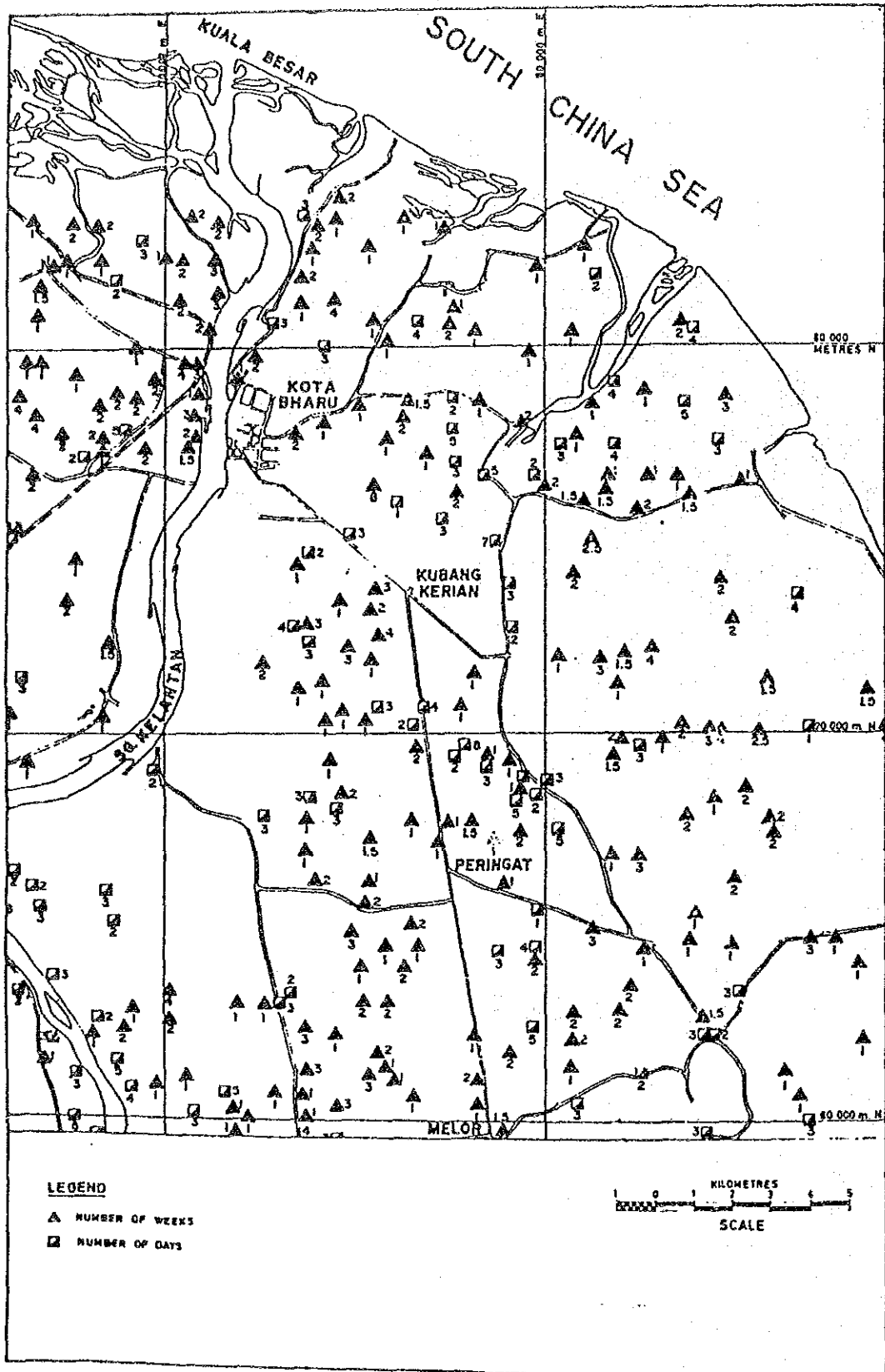
また、コタバル市内のあちこちに Kuala Kerai 地点水位と当該地点の氾濫水位の関係を図示した看板をクランタン州の DID が立てており、なかなかのアイデアである。また、これに関連して小さなポスター (図 IV-6-2) も作成している。

図IV-5-1 JANUARY 1967 FLOOD



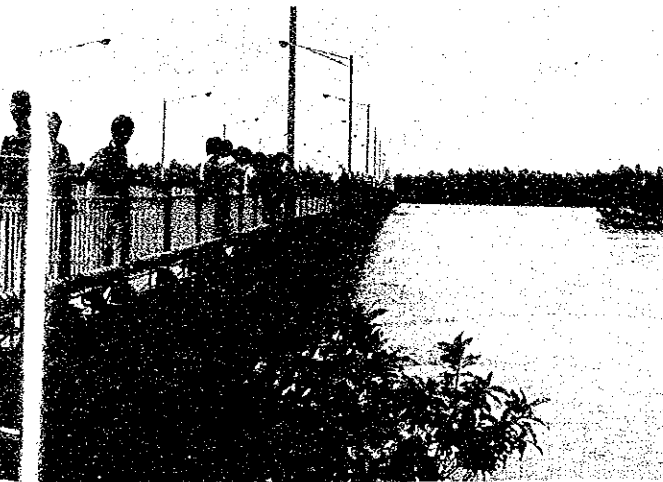
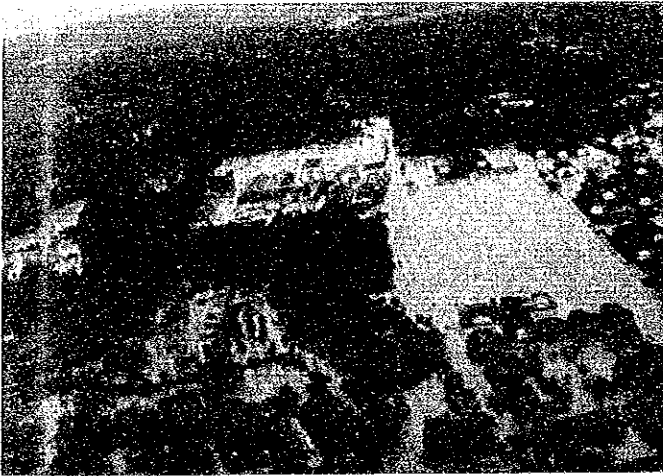
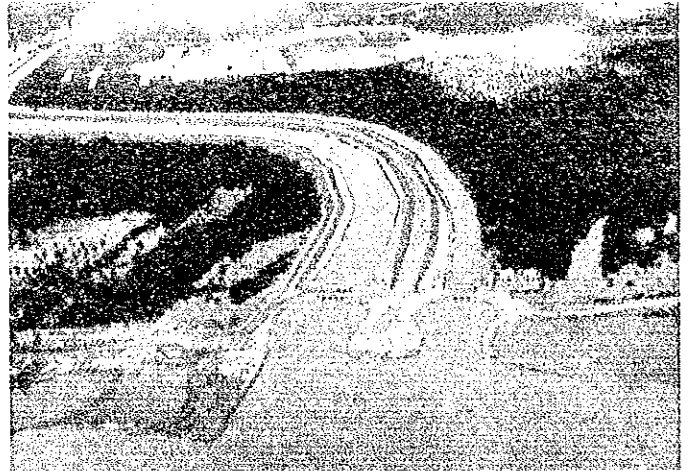
(1967年洪水の浸水区域図  
(ENEX報告書, Vol. 1, 1977, Plate 2より))

図IV-5-2 DURATION OF FLOODING



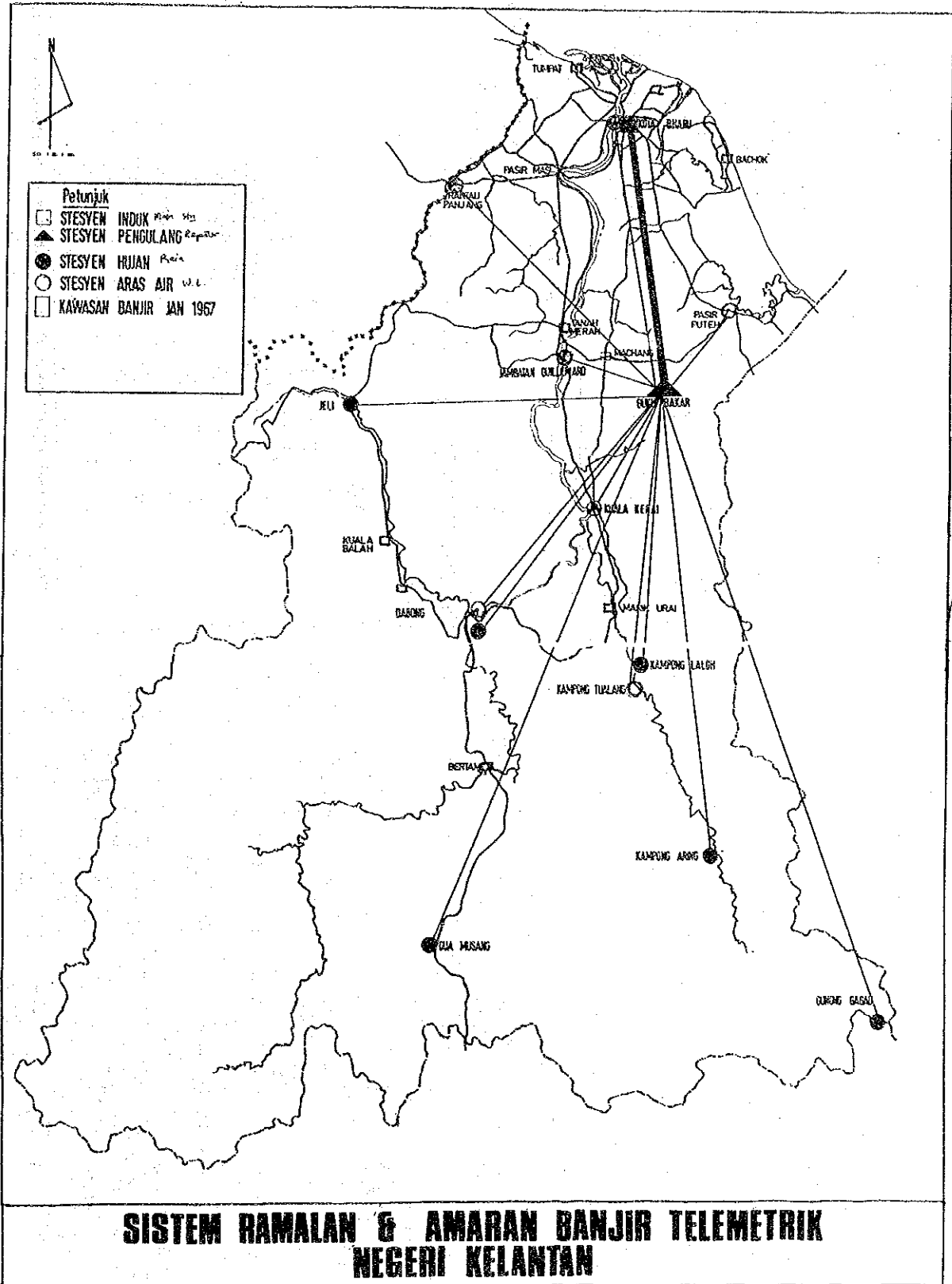
(1967年1月洪水の浸水時間  
 (ENEX報告書, Vol. 1, 197, 図12.2より))

写真Ⅳ—5 1979年洪水






図IV-6-1 現状のテレメーター・システム図





図IV-6-2 洪水警報に関するポスター (DID 作成)

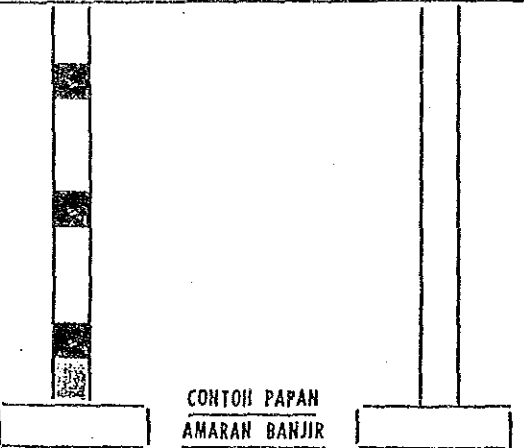
SIN. NO. R. 01




**AMARAN BANJIR TEMPATAN  
DI KOTA BHARU**

KAWASAN INI AKAN DIBANJIRI APABILA PARAS AIR 50  
KELANTAN DI KUALA KRAI MENINGKAT SEPERTI BERIKUT:

| PARAS AIR DI KUALA KRAI | PARAS AIR DISINI |
|-------------------------|------------------|
| 75 KAKI (23m)           | PARAS            |
| 85 KAKI (26m)           | PARAS            |
| 95 KAKI (29m)           | PARAS            |
| 105 KAKI (32m)          | PARAS            |



**CONTOH PAPAN  
AMARAN BANJIR**



**PANDUAN MENGENAI  
PAPAN AMARAN  
BANJIR TEMPATAN  
(SUNGAI KELANTAN)**

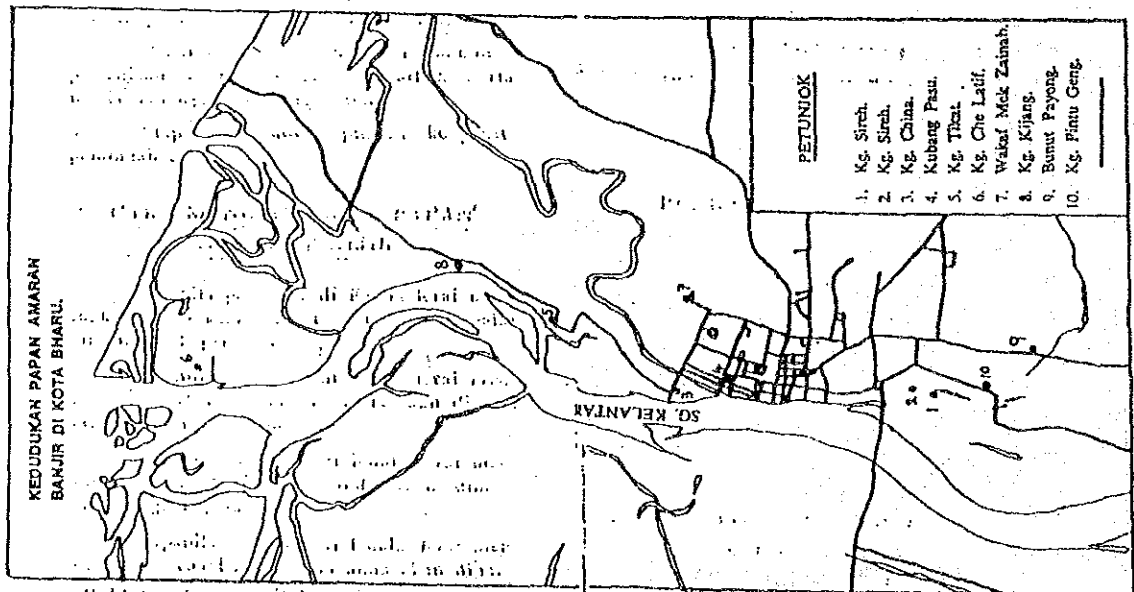
**TUJUAN:**

Papan amaran banjir ini membolehkan

DI KUALA KRAI

DI TEMPAT ANDA

75 kaki (23m.) →



Sila lihat contoh papan amaran banjir.

Guchil

0 jam!

## V 本格調査の内容

### 1. 調査の基本方針

#### (1) 概要

クランタン川流域は、1967年の大洪水をはじめとし、連年のように雨期になると、コタバル市を中心として大きな洪水に見舞われており、クランタン州の経済・社会的な発展の大きな障害となっており、この洪水の軽減はマレーシア政府の重要な課題のひとつとなっている。

本河川の洪水軽減のための方策については、従来より散発的に複数の調査が行なわれてきている。しかしながら、本河川全体について、一貫した調査はまだ行なわれていない現状にある。

以上のような背景のもとに、1987年3月14日にマレーシア国経済計画庁（E. P. U.）の長官 Wan Norma Wan Daud より在『マ』日本大使館に対して、クランタン川洪水軽減調査についての要望書が出された。

本調査の目的は、以上のような状況を踏まえて、クランタン川流域の一貫した洪水軽減計画（河川計画）を策定するとともに、抜本的な対策として主要構造物（例えばダム）着手といったような対策に着手する動機づけになるように配慮することにある。

#### (2) 課題

クランタン川の治水に関する課題は、概観すると次のように考察される。

- ① クアラ・クライ付近の中流域における洪水は、掘込河道に流下能力以上の洪水が到達するために、オーバーフローを起こし、中流域の平野を水浸しにするものである。
- ② コタバル周辺においては、河道の蛇行や河口の土砂による閉害等に起因して、河川の水位が高くなることによって、溢水を起こし周辺の洪水をもたらす。
- ③ コタバル周辺の地域においては、そこにもたらされる大きな降水量によって、内水氾濫が起こる。

#### (3) 検討にあたって留意すること

- ① 既往の調査資料が比較的豊富であり、また、『マ』側が通曉していると考えられるので、充分慎重にレビューしておく必要がある。
- ② ダムは、レビル、ダボンの他1～2となると想定される。
- ③ レビルダムについては、先行調査ではほぼ十分なデータが得られるものと想定される。ただし、洪水調節については慎重に再検討する必要がある。
- ④ ダボンダムについては、ダムサイトの地質調査を行う必要がある。また、貯水池の範囲を確実にするためには、10,000分の一程度の地質図が最低限必要である。
- ⑤ 第三および第四のダムについては、上記の二つのダムよりは、プライオリティは、下がるものと考えられる。

- ⑥ 河道の基本洪水は、非常に大きいので、ダムで相当量のカットをしなければ、計画が成り立たないと考えられる。
- ⑦ 中流部の河道は、自然の堀込河道となっているので、必要な個所に護岸を施工する程度とする。
- ⑧ 下流の水衝部については、適当な工法を検討するとともに、ショートカットをも検討する。
- ⑨ コタバル市周辺については、特別に洪水対策を検討する。
- ⑩ 河口付近については、河口閉塞対策の検討を行なうとともに、海岸侵食についても配慮すること。
- ⑪ 現在での調査の過程での技術移転、セミナーの開催、日本でのトレーニングを行う必要がある。

## 2. 対象地域及び範囲

### (1) 対象地域

- ① クラントン川上流域,ダム付近
- ② クラントン川中, 下流域, 洪水被害調査, 治水施設計画(ダムサイト)及び non- structural measures

### (2) 調査範囲

- ① 治水マスタープラン調査
- ② ダム計画, プレフィージビリティ調査
- ③ ダムサイトの施設計画調査
- ④ non- structural measures 調査

## 3. 調査項目及び内容 (図V-3-1参照)

### (1) 計画対象洪水の検討

#### ① 洪水被害の分析

大きな洪水ごとに作成されている洪水報告書及び地形図をもとに、氾濫実態、被害形態、被害額等の洪水被害分析を行う。

#### ② 水文解析

洪水被害を発生させた降雨の強度、分布、確率等について分析するとともに、降雨と流量との関係について分析する。

#### ③ 社会経済状況、土地利用状況の把握、諸計画のレビュー

洪水防御、水資源開発のため、社会経済状況、土地利用状況を把握するとともに、それらに關係する諸計画について、詳しいデータも含めてレビューを行う。

#### ④ 計画対象洪水の決定

①②③をふまえ、洪水把握と洪水被害の関係を分析し、計画対象洪水について、picseごとに決定するとともに洪水防御による便益を検討する。

#### (2) 計画対象洪水のダム河道等への配分

①②の計画対象洪水の流量を、ダム河道等に配分する。

以下これに基づき、ダム計画、河道計画等の検討を行い、これらの結果のフィードバックを適宜行ない、最終的に picse ごとの計画対象洪水の配分のいくつかの組合せとして整理する。

#### (3) ダム計画の検討 (図 V-3-2 参照)

##### ① ダム候補地の選定

全国マレイシア水資源計画及び ENEX クラントン川流域調査の結果を参考に、地形図からダム適地を検討し、現地踏査等により、ダム候補地の選定を行う。

##### ② 治水容量の検討

①で選定されたダム候補地について、(1)④の計画対象洪水の流量で、(2)によりダムに配分された流量に対し、各ダム候補地ごとに地形上から可能最大ダム高を求め、治水容量をいくつか設定して貯留計算により治水効果を検討し、適正な組合せを検討する。

また、現在別に JICA の技術協力で F/S として検討中のレビルダムの治水計画のあり方について検討し、それも含めて、ダムの治水容量の全体を検討する。

##### ③ 利水容量の検討

(1)③の結果をふまえ、全国マレイシア水資源計画をレビューし、水需要量を設定するとともにそれに対する便益を評価する。

ダム下流の維持流量を設定し、水文解析の結果を用い、ダム補給計画を行ない、各ダムの利水容量を検討する。

##### ④ 堆砂容量の検討

近傍ダムの堆砂計画、堆砂実績等から、堆砂容量を検討する。

##### ⑤ pre F/S を行うダムの選定

各ダム候補地の比較検討を行い、pre F/S の対象とするダムの選定を行う。

##### ⑥ 選定されたダムの pre F/S の検討

地形図 (ダムサイト 1/500, 貯水地 1/10,000) を航空写真撮影、解析して作成するとともに、水没地の家屋数、農地面積等を把握する。

また、ダム高に応じた Saddle dam の必要性についても検討する。

ダム以外について、現地踏査、物検、ボーリング等の地質調査を実施し、分析する。

ボーリングの1ダム分はマ側が負担する。本調査開始後第4月のはじめからマ側がボーリングをやるよう、その場所を指示する必要がある。

地質調査担当者は、マ側ボーリング調査中（第7月まで）マ側で指導する。又、ダムの種類を検討するとともに、それに応じた堤体機構の賦存状況について現地踏査により調査する。

ダム貯水池、水没地を中心に、オランアスリ、野生動物、森林等の環境への影響について調査する。また、ダム堆砂による海岸の侵食に対する影響について検討する。

⑦ 計画対象ダムの選定

⑥の pre F/S 検討結果をふまえ、phase ごとにマスタープランに位置づけるダムを選定する。

⑧ ダム構造等の概略設計

選定されたダムについて概略設計を行う。

⑨ 施工計画の検討

ダムの種類、地形、地質等をふまえ、施工計画の概略を検討する。

⑩ 建設費、維持管理費の算定

現設ダムの実績を参考に補償費等も含め、建設費、維持管理費を算定する。

⑪ 維持管理の計画及び体制検討

現設ダムの実態を参考に、維持管理計画及び体制のあり方について検討する。

⑫ 段階別ダム計画の社会経済及び環境への影響検討

上記の検討内容をふまえ、phase ごとのダム計画について、社会、経済効果を検討するとともに、環境への影響も検討する。

なお、ここで、発電の可能性及び効果についても言及する。

(4) 河道計画の検討

① 河道の縦横断形、法線形の検討

流出解析等によって得られた流量を処理する河道（下流 0～90km 区間）について、改修区間、縦横断形、法線形を検討する。

河道状況、主要構造物の状況、地形状況、人工・資産の集積状況等を把握したうえで、改修を実施する必要のある区間を検討する。

今回、実施する縦横断測量図を使い、水理計算によって河道水面形を追跡し、適切な河川縦横断形を設定する。また、上流から相当量の土砂の供給があると考えられることから、河床変動解析も合わせて実施し、縦断形の検討に資する。

② 河口処理の検討

河口の形態がクランタン川下流部の水位に大きな影響を与えられることから、河川流量・流速、波浪、土砂の粒径、河口の変遷等を把握したうえで、放水路、開削方法、河口土砂のフラッシュ方法、しゅんせつ等の維持管理について総合的な河口処理を検討する。

なお、河口処理の方法は、①の河道の縦横断形、法線形と密接な関係があることから、

それぞれフィードバックを行って検討を進める。

③ 堤防等の概略設計

設定された縦横断形、法線形に対して、堤防等の主要構造物の概略設計を行う。なお、洪水の継続時間、堤体材料等についても留意する。

④ 内水対策の検討

河道の縦横断形や河口処理の方法がある程度固った段階で、内水対策について検討する。本川と内水域の流出特性、内水域の地形特性、土地利用状況を踏まえ、できるかぎり建設費、維持管理費のかからない方法とする。

⑤ non- structural measures の検討

non- structural measures について、新規のもの（例えば、洪水の予・警報システム等）があれば、その概略の検討を行う。

⑥ 河川の利用法の検討

河川堤防と道路の兼用の可能性、河口部における港湾設置の可能性等について検討する。なお、検討にあたっては、マレイシア側の政策判断と十分な調整が必要である。

⑦ 建設費等の算定

築堤、掘削、主要構造物等の補償費も含めた概略の建設費、維持費を算定する。最終的な改修計画は広範囲なものとなる可能性があるので、区間ごと、段階ごとの費用についても算定する。

⑧ 計画案の比較検討

最終的な計画案、段階的な計画案について、建設費、維持管理費、non- structural measures での対応、河川の利用法、社会・経済・環境への影響等を総合的に比較検討し、最終案を提示する。

⑨ 建設・維持管理のための制度・体制の検討

改修工事、通常の河道維持、被災時の復旧、河口維持、占用、河川情報管理等を実効のあがるものとするための制度・体制について検討を行う。

(5) 各種施設の組合せの検討

各種施設の組合せごとにその社会経済効果及び環境について検討し、マスタープランを算定する。

(6) その他の留意点

① 流域および河道のモデル化を行なう。（貯留関数法）

② 水文資料を収集整理して、洪水の継続時間を検討し、確率毎の雨量を決定する。

③ 確率毎・流域毎の流量を算定し、河道に流れるべき流量（不定流）を計算する。

④ ダムサイト候補地点を検討し、建設可能なダムの規模を検討する。（ダム高・工費・問題点等）

- ⑤ これらのダムによって、洪水（確率毎）がどの程度軽減されるかを検討する。
- ⑥ 軽減された洪水を安全に流下させるための河道を設計する。  
河道縦断・河道横断面・ショートカット・河口の浚渫・河口閉塞対策・放水路
- ⑦ その他留意すること  
内水の排除については、ポンプ建設は経済的に非常に困難であるので、極力重力排水とする。  
氾濫原の土地利用についても検討すること。  
洪水予報・土地の利用規制等の非構造的な対策についても言及すること。  
執行体制についても助言すること。
- ⑧ 氾濫解析は、治水計画の評価をするうえで必要不可欠のものであるが、クランタン川の下流平野部の氾濫域は、起伏が少く、周辺の小河川流域までも取り込んだものになることから、解析にあたっては単なる標高だけでなく、主要道路、主要水路等の高さや系統等にも注目する必要がある。これは、内水解析においても同じようなことが云える。
- ⑨ 地形図については、1975～'76作成の1/6,300モザイク航空写真及びその地積図、標高図があるので、これを、1980～'81の1/40,000の航空写真により地形変化部分のみ修正して使用し、また、河道の平面図はENEX作成の1/25,000を使用する方向で考える。
- ⑩ 河川横断面図については、ENEXが作成した5kmピッチのものがある。今回、1kmピッチで横断測量を実施し（5%はマレイシア側で実施）、精度を向上させる。  
横断面図のピッチは異なるが、ENEX作成のものと、今回作成のものがそろふことにより、河床変動解析にも資するものと考えられる。
- ⑪ 河床材料については、questionnaireの回答では、ENEXの報告書に資料があることになっているが、河床変動解析あるいは建設資材の検討に使えるレベルでのデータの所在が確認できなかった。さらに詳細なデータの所在の確認を行ったうえで、必要ならば河床材料調査についても実施する必要がある。
- ⑫ 現在のクランタン川の河口は、もともと本川が砂嘴のために大きく北にう回し、これとは別に数年前、内水排除の目的で開削した小水路が、その後の洪水でフラッシュされ、今は500mを越える河中となって海に注ぎ、これがあたかも本川河口のようになっている。しかし、この後者の河口も河中は広いものの水深が浅く、汀線では碎波が生じている。  
一方、クランタン川上流域では大規模な森林開発が行われていることもあって、クランタン川は年間を通じて相当な濁水となっており、土砂の運搬量はかなりの量になるものと考えられる。また、河口付近にも比較的粗い砂が堆積していたことから、河道の縦断の設定、河口処理については慎重な検討が必要である。
- ⑬ non-structural measures 環境、河川の利用の検討については、本検討レベルでは付加的なものでよいと判断されるが、マレイシア側において、これらの事項について特に強調

して検討をせまる向きもあるので、慎重な対応が必要である。

#### 4. 調査工程

調査は、マレーシア国内での現地調査と、主に日本国内で行われる解析作業とで構成される。

現地調査期間は、都合8ヶ月間を予定し、第一次は6.5ヶ月間で、資料収集、補足調査及び流域治水計画の基本事項の検討等が主体であり、第二次、第三次は、それぞれ1ヶ月、半月間でインテリムレポート及びドラフトファイナルレポートの説明、協議等が となっている。ファイナルレポートの提出まで合計17ヶ月間の工程を予定している。

全体調査工程（案）は下表の通りである。

| MONTH ITEM        | 1         | 2 | 3        | 4 | 5      | 6         | 7     | 8 | 9 | 10    | 11        | 12 | 13       | 14 | 15 | 16 | 17 |
|-------------------|-----------|---|----------|---|--------|-----------|-------|---|---|-------|-----------|----|----------|----|----|----|----|
| STUDY IN MALAYSIA | -----     |   |          |   | ← 追加 → |           | ----- |   |   | ===== |           |    |          | =  |    |    |    |
| STUDY IN JAPAN    | =         |   |          |   | -----  |           |       |   |   | ----- |           |    |          |    | =  |    |    |
| REPORT            | △<br>IC/R |   | △<br>P/R |   |        | △<br>IT/R |       |   |   |       | △<br>DF/R |    | △<br>F/R |    |    |    |    |

#### 5. 報告書

以下の報告書を作成し、マレーシア側に提出のうえ、説明、協議等を行う。

1. インセプションレポート（30部） 現地調査開始後1ヶ月以内に提出。
2. プログレスレポート（30部） 調査開始後4ヶ月以内に提出
3. インテリムレポート（30部） " 10ヶ月 "
4. ドラフトファイナルレポート（30部） " 14ヶ月 "

マレーシア側は、当報告書受理後1ヶ月以内にコメントを日本側に提出する。

5. ファイナルレポート（100部） ドラフトファイナルレポートに対するマレーシア側の意見を得て2ヶ月以内に検討の上提出する。



## 6. 要員計画

本調査の主要担当分野は次のとおりである。

- ① 総括
- ② 治水計画（副総括）
- ③ 水文・水理
- ④ 水資源計画
- ⑤ 測量
- ⑥ 地質
- ⑦ ダム計画
- ⑧ 河道計画（含河口処理）
- ⑨ 施設設計Ⅰ
- ⑩ 施設設計Ⅱ
- ⑪ 施工・積算
- ⑫ 社会・経済
- ⑬ 非構造物計画
- ⑭ 環境

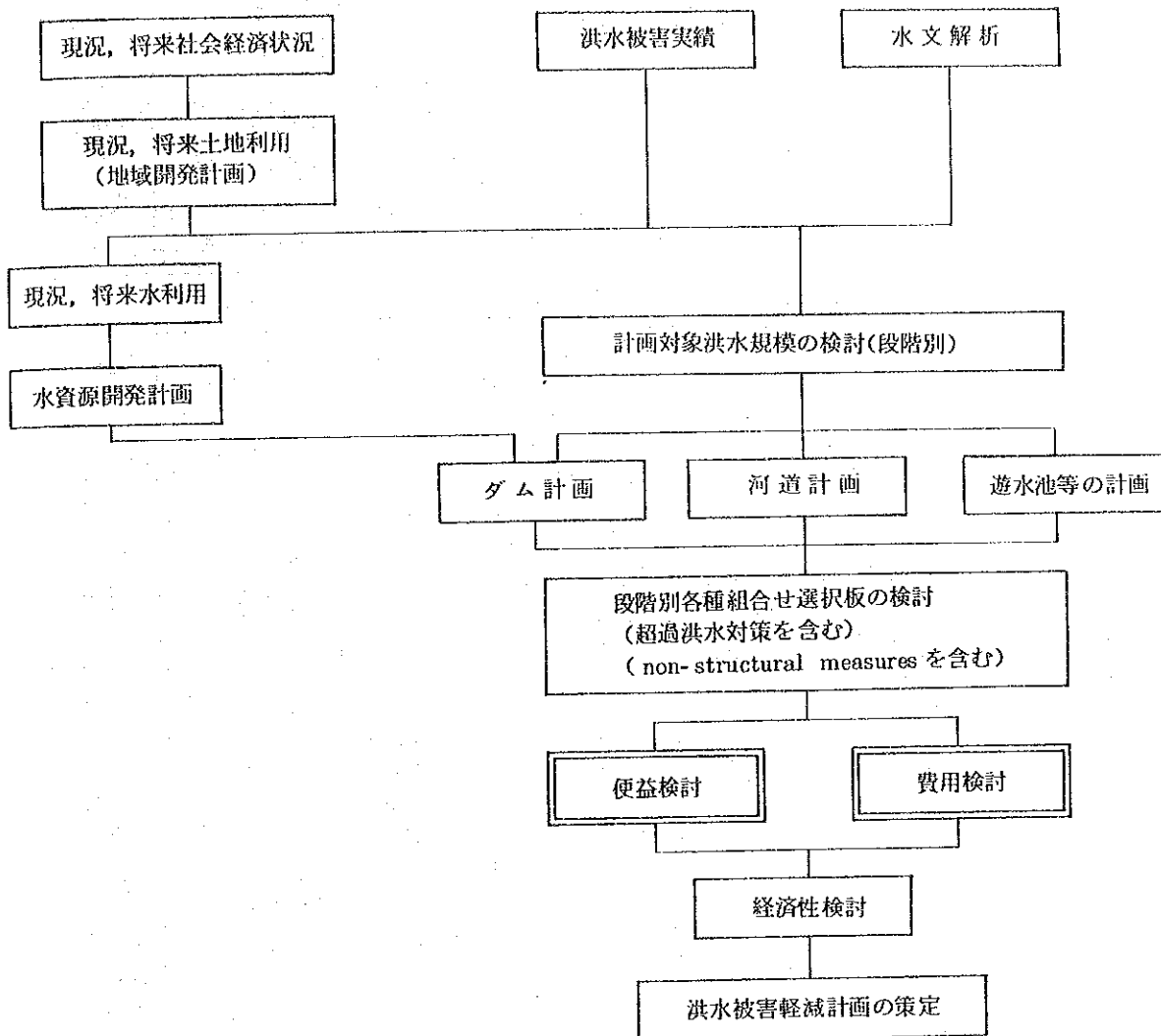


図 V-3-1 調査の全体フロー

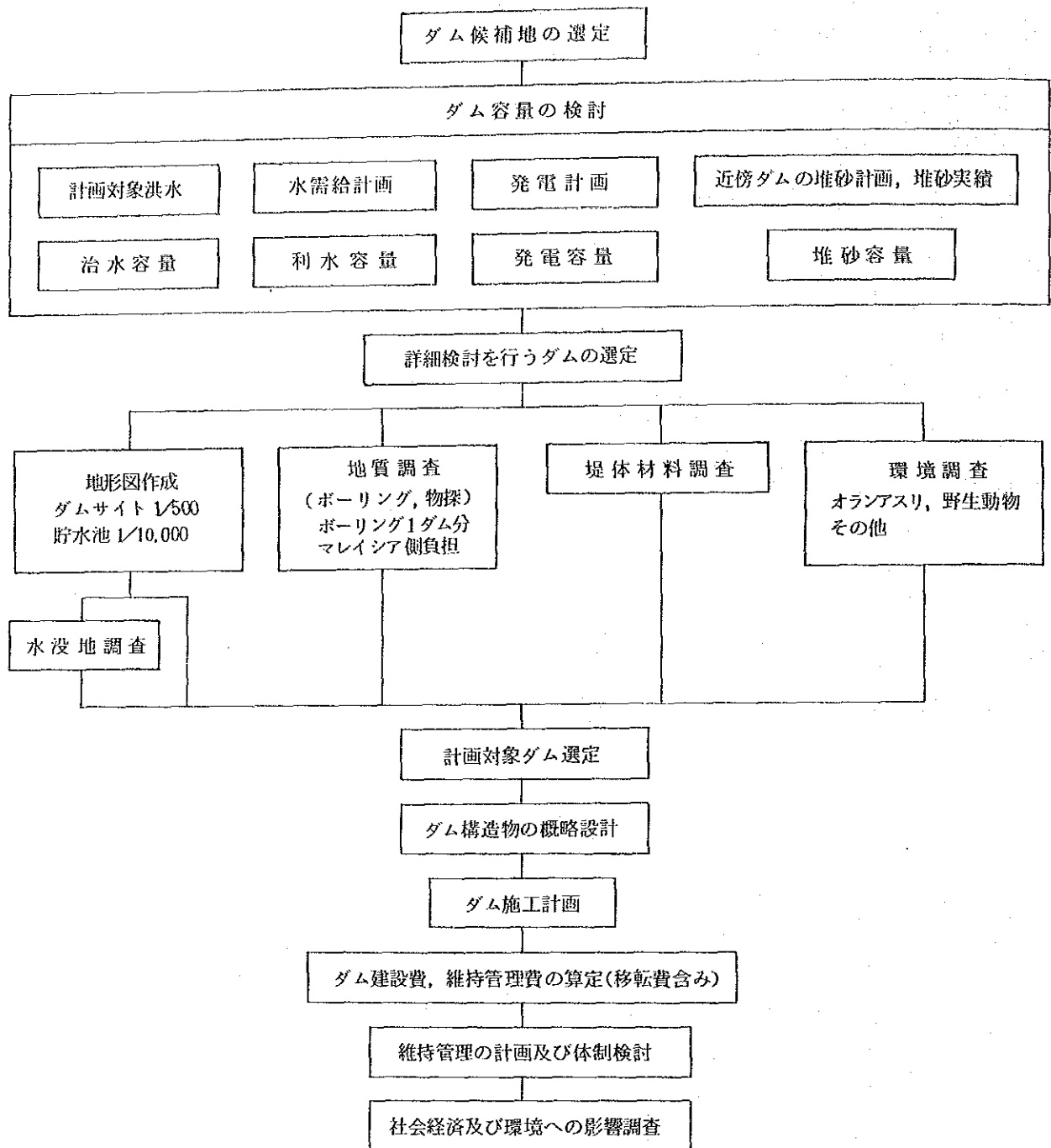
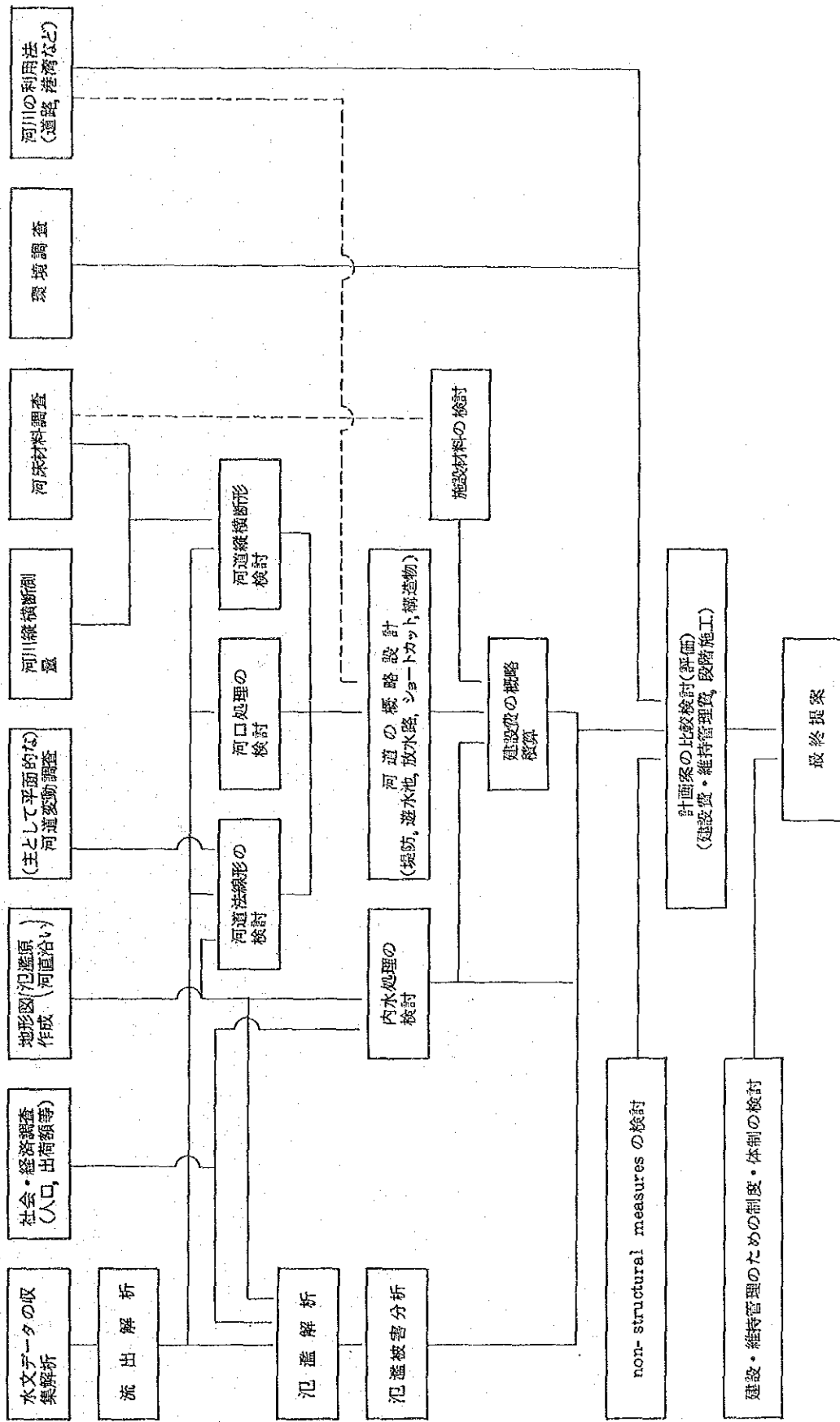


図 V-3-2 ダム計画の調査フロー

図 V-3-3 河道の調査フロー





( 添 付 資 料 )

1. マレーシア国政府からの技術協力要請書 ( TOR )
2. Scope of Work ( S/W )
3. Minutes of Meeting ( M/M )
4. 基礎資料の賦存状況
5. 面談者リスト
6. 事前調査に関する新聞報道



# 1. マレーシア国政府からの技術協力要請書

## TERMS OF REFERENCE FOR FEASIBILITY STUDY OF KELANTAN RIVER BASIN-WIDE FLOOD MITIGATION STUDY

### 1. BACKGROUND

#### 1.1 Introduction

The State of Kelantan lies in the north-east of Peninsular Malaysia and is bounded on the west by the State of Perak and Thailand, on the south by the State of Pahang and on the north-east by the State of Terengganu and the South China Sea. The Sg. Kelantan and its principal tributaries drain approximately 85 % of the State's total area of 15,000 square kilometres.

The hinterland of Kelantan is bounded by mountain ranges which form the watershed of the Sg. Kelantan river basin. Here, settlements and agriculture are sparse, and except for scattered groups of orang asli, are confined to two main valleys; the Galas and the Pergau. Ground slope is generally steeper than 15 degrees.

The coastal region comprises alluvial plain, seldom more than 15 metres above sea level, and protruding into the South China Sea. Consequently, land drainage generally is inefficient and streams tend to be sluggish and meandering. These combine to promote widespread flooding whenever heavy rain falls and this has been an important constraint on the agricultural development of the region. This region supports some 85 percent of the population of the State. The average population density is about three people per hectare (six times the density in the hinterland) and this is expected to double within the next 30 years.

From November to January, the climate is dominated by the North East Monsoon blowing across the South China Sea. This brings heavy rain, especially to the coastal region which receives about half its average annual rainfall of some 2700 mm in this season. The maximum daily rainfall recorded is over 600 mm and a three day storm can produce over 1200 mm.

Periodically, severe flooding, caused by a combination of torrential local rainfall and overspill from the Sg. Kelantan, seriously affects the populated areas of the coastal region and the main valleys of the hinterland. Very big floods such as in 1926 and 1967 are disastrous. In the January 1967 flood, more than 200,000 hectares of the coastal region were inundated to depths of up to six metres and over 300,000 people were seriously affected. Four floods of the 1967 magnitude or larger have occurred during this century.

The average annual flood damage to crops and property is estimated to be about \$ 16 million. This will increase as the population increases and the State develops, to an estimated \$ 42 million in 2005. The



damage to the economy is more than the direct cost of crop and property damages. Periodic flooding deters the adoption of new agricultural technology by farmers and results in low productivity of the agricultural sector. The flood threat has in addition, depressed the investment climate of the State. Removal or reduction of the flood threat is therefore seen as the most important prerequisite for a progressive economy in Kelantan.

## 1.2 Existing Studies

The Kelantan River Basin Study (1977), was the first major comprehensive study on the resources of the river basin. The Study recommended a Basin Development Plan made up of a series of capital works projects embracing drainage and irrigation, flood control and hydro-electric works to be developed in conjunction with a broadly based agricultural and farm program, forest industry, hinterland conservation strategy and land use planning.

A total of 18 damsites were investigated for multipurpose uses. In respect of flood mitigation, 4 dam projects were identified to have significant potential. Of these, two damsites on the Sg. Galas are mutually exclusive. The Dabong dam at Sg. Galas was assessed to be the most important while the others, namely Kemubu, also on Sg. Galas, Jeram Panjang on the Sg. Lebir and Bertam on the Sg. Nenggiri were considered to have lesser mitigation effects on coastal flooding. The table below gives the relative contribution at the various damsites on the 1967 flood at Guillemard Bridge.

| Damsite       | Catchment Area (sq km) | Percentage Area Contributing to Guillemard Bridge | Percentages of 1967 Flood at Guillemard Bridge |                |
|---------------|------------------------|---|--|----------------|
|               |                        |   | Flood Volume                                   | Peak Discharge |
| Dabong        | 7,480                  | 62  | 49   | 57             |
| Kemubu        | 5,795                  | 48  | 24   | 27             |
| Jeram Panjang | 2,480                  | 20  | 22   | 26             |
| Bertam        | 3,940                  | 33  | 15   | 19             |

The Kelantan River Basin Study recommended the development of only two multi-purpose dams to reduce the major flooding problems due to over spill from the Sg. Kelantan. These dams will also enable electricity to be generated and will regulate the river flow to meet the irrigation demands of the coastal plain. The development priority was proposed to be the Dabong dam on the Sg. Galas, to be followed by the Jeram Panjang dam on the Sg. Lebir.

The Interim Report on the feasibility of the Lebir Hydroelectric Power Development Project (1981) recommended further study of the Jeram Panjang damsite. It showed that the project could augment dry weather river flows in the Sg. Kelantan to a guaranteed 80 cumecs, equivalent to 80 % of the long term dry season agricultural demand.

The National Water Resources Study (1982) highlighted among other things, the need to develop the major identified dams to meet the long term water requirement of Kelantan. In addition, the study confirmed the necessity of these dams to resolve the problems of flooding in the coastal region of Kelantan.

The study for the Flood Mitigation Scheme for Kota Bharu (1983) recommended the construction of a river bund along the right bank of Sg. Kelantan as an interim flood protection measure prior to the implementation of long term measures.

According to the Water Supply Study in Northern Kelantan (1985) the implementation of a multipurpose impounding reservoir would satisfy all future water supply and irrigation demands. Until a regulating reservoir is built, it will be impossible to use Sg. Kelantan as a reliable water source owing to low drought flows.

The Golok River Basin Study (1985) stated that the least cost supply of water for the Sg. Golok river basin would be by pumping from Sg. Kelantan and therefore timing of any source development on the Sg. Kelantan is crucial to development in the Sg. Golok basin.

As part of the Feasibility Study for the Nenggiri Dam Project, a study was made of the downstream flood mitigation effect due to the dam. The draft Flood Mitigation Report (1986) concluded that the effect of Nenggiri on peak flood discharges is small, though the impact on annual damage mitigation is about 25 percent. With Dabong and Lebir dams in operation, the flood mitigation benefits attributable to Nenggiri would be insignificant. However, Nenggiri dam will have an effect on the flood surcharge in Dabong reservoir, resulting in a lowering of the 50 year flood maximum water level by 2 metres. It further recommended that a full regional floods study for the State be performed, and that a more thorough evaluation be carried out on the influence of Sg. Kelantan on coastal plain flood damage combined with the effects of inadequate drainage of intense, localised storm runoff.

### 1.3 Necessity of the Study

The urgency of the need for a basin-wide flood mitigation study of the Sg. Kelantan river basin was brought into focus during the recent November-December 1986 floods, when the coastal areas were badly affected by floods resulting from intense local rainfall. The rainfall which fell in Kota Bharu over a period of 7 days was estimated to have a return period of 1 in 50 years. In all, about 2,390 square kilometers of land along the coast was affected by floods, with some areas inundated to a depth of over two meters. A total of 7,822 people were evacuated and four lives were lost.

The 1986 flood was the latest in a series of floods and droughts to hit the State in the last five years, the others being in 1982, 1983 and 1984.

The threat of floods has always been an obstacle to meaningful progress in the State, both in agriculture as well as in industry. The removal of this threat will provide a new opportunity for agriculture where new technology can be applied to the full. It would also encourage the development of new agro-based industry which could indirectly stimulate agricultural development since food processing industries serve as good outlets for surplus agricultural produce. With flooding under control, there would be no longer restraints to greater economic, social and industrial development in the State.

Besides the flood threat, the water supply situation has also given rise to some concern. There has been in recent years, considerable population, agricultural and industrial growth in Kelantan, particularly in the coastal plain, rendering the water demand from the Sg. Kelantan to approaching its limits of capability. The population of the State reached 1.0 million in 1985 and is expected to increase to 1.3 million in 2000. As a result, the domestic and industrial water demand in the populated coastal plain is expected to increase from 144 Mld (million litres per day) in 1985 to 314 Mld in 2000.

Sg. Kelantan presently is the source of irrigation for some 32,000 hectares of padi land. In addition, the Kemasin-Semarak Integrated Rural Development Project with an irrigable area of 11,900 hectares is currently under implementation and is scheduled to be operational by 1990. Other areas amounting to 6,000 hectares have been identified which will require additional water from the river. Besides this, the KADA II Improvement Project involving intensification of irrigation facilities for the Kemubu irrigation area is proposed for implementation in the near future. The net effect of all these development is an increase in irrigation water abstraction from Sg. Kelantan in the critical month of April from the present 72 cumecs to 85 cumecs by 2000.

The various studies have highlighted the need to develop source facilities both to resolve the problems of flooding as well as to meet the long term water requirement of the State. However, the proposals to develop Dabong dam or other large scale source facilities were not pursued with, primarily because large tracts of land would be inundated and tens of thousands of people would need to be resettled. A feasibility study on the Lebir dam project which started in 1979 was curtailed in 1980 due to constraints arising from other developmental needs and priorities then.

Since 1982, as a result of a number of floods and droughts which affected the State, there has been a pressing need to re-examine the proposals of regulating the Sg. Kelantan and to consider the implementation of source development both for flood mitigation and meeting the needs for water supply and irrigation.

Over the last decade, there has been considerable development in the Pergau-Galas valley vicinity, much of which falls within the reservoir

area of the proposed Dabong dam. Whilst at the time of the Kelantan River Basin Study, it was estimated that about 10,000 people would be affected by the reservoir, this figure is now expected to be much higher. Consequently, there is now some concern on the socio-political acceptance of a large dam at Dabong, as against a series of smaller dams.

Recently, the Government and the Japan International Cooperation Agency (JICA) have agreed to a resumption of the Lebir Dam study. The study will examine the feasibility of the Lebir dam for multi-purpose uses including hydro-power and flood mitigation. The effectiveness of the Lebir Dam study will be dependent on the prior study of a basin-wide flood mitigation study of the Sg. Kelantan.

## 2 OBJECTIVE OF THE STUDY

The objectives of the Study are :

- (1) To carry out a full regional flood study of the Sg. Kelantan river system, including the contribution to flooding from intense coastal rainfall.
- (2) To review all existing and proposed flood mitigation and water resources development plans of the Sg. Kelantan river basin based on the most recent data and information and to present a number of alternative master plans on flood mitigation and water resources development to permit decision making by the Government on the further development of the basin. In this context, while emphasis should be placed on flood mitigation, other aspects of water resources, in particular water supply for irrigation, domestic and industrial water, should also be considered.
- (3) To determine the best location for one or more dam(s) in the upper catchment of the Sg. Kelantan, so as to present an optimum solution to the flood problem in the Sg. Kelantan river basin, and to fully develop the water resources of the river for multi-purpose uses. The dam(s) shall be selected with a view to minimising the extent of land to be inundated, the number of people to be resettled, the services and facilities such as roads and railway line to be relocated and other adverse effect.
- (4) To examine the engineering feasibility of the selected dam(s).
- (5) To present the results and findings of the study in the form of reports sufficient for decision making.

### 3. SCOPE OF WORK

The work to be carried out in the Study, shall comprise but not necessarily be limited to the following :

#### 3.1 Surveys and Basic Studies

- (1) Collect and review all pertinent studies, reports and other documents.
- (2) Prepare technical specifications and a detailed programme for field investigation to collect, process, review and compile all relevant technical, topographical and hydrological data of Sg. Kelantan and its catchment area. The investigation shall include:
  - (a) Aerial and ground surveys of proposed development areas, including the installation of survey posts and benchmarks. The surveys shall cover :
    - Aerial survey : Flood vulnerable areas and proposed reservoir(s) inundation areas, in the reaches upstream of Guillemard bridge (approx. 11,900 km<sup>2</sup>)
    - Ground survey : Supplemental topographic survey at proposed damsite(s) and river profile/cross section surveys along the rivers.
  - (b) Review hydrological and meteorological data and proposed additions to the hydrometeorological network as necessary together with sediment samples.
  - (c) Flood damage survey for both upstream and downstream of the Sg. Kelantan and the coastal area including estimate of the flood damages.
  - (d) Geotechnical and geological investigation of proposed structure sites, through review of the existing data and surface investigations.
- (3) Collate and review previous assessment of the water demand and supply situation in downstream areas for agricultural, domestic and industrial water demand based on firm and committed plans.
- (4) Carry out a regional flood analysis of the Sg. Kelantan system with respect to both the upstream and downstream flooding and including the contribution to flooding from intense coastal rainfall.
- (5) Prepare a geomorphological survey map of the coastal region showing classification of flood stricken areas.
- (6) Carry out a socio-economic survey of the study area, in particular riverine and proposed reservoir(s) impoundment areas, in-

cluding the population to be displaced by construction activities and reservoir impoundment.

### 3.2 Plan Formulation

#### (1) Study on multipurpose dams :

(a) Examine the flood mitigation effects of the following dams both singly and in various combinations, and any other dam(s) as may be considered useful :

- Dabong dam on Galas River
- Jeram Panjang dam on Lebir River
- Nenggiri dam on Nenggiri River
- Kemubu dam on Galas River
- Lower Pergau on Pergau River

Of the above, the Government recently completed a feasibility study for Nenggiri dam and has a schedule to undertake a study for Jeram Panjang dam. The findings from those studies shall be taken into consideration in this Study.

(b) Carry out comparative studies of the above dams on the basis of flood mitigation and water resources development, produce and evaluate preliminary designs to show the benefits and ranking of the alternatives.

(c) Examine the optimum development of the selected dam(s), together with presentation of several alternatives with a view to maximising benefits and minimising costs. Particular emphasis should be given to minimising the extent of land to be inundated, the number of people to be resettled, the services and facilities such as roads and railway line to be relocated and any other adverse effects.

#### (2) Downstream flood mitigation plans :

Examine the downstream flood mitigation plans, in both cases of with and without the upstream dam plans. The study shall cover all possible combinations of structural measures (such as river channel improvement, bypass waterways, polders, etc.) and non-structural measures including flood forecasting/warning system.

#### (3) Formulation of optimum development plans :

Formulate optimum plans to fully develop the water resources of the Sg. Kelantan to meet the requirements of water supply and other downstream water uses. Determine the hydropower potential of the selected dam(s). In addition it may be possible to incorporate into the project, certain facilities and features for the future development of tourism and fresh water fishery.

(4) Resettlement proposals :

Study and formulate appropriate resettlement proposals with plans and estimates to a preliminary study level.

3.3 Environmental Impact Assessment

The study shall cover an assessment of the probable environmental impact of the dam(s) and other structures proposed in the place. The study shall include recommendations to eliminate or reduce probable undesirable effects, and to enhance or develop other beneficial effects and potential. The findings of the study shall be compiled into an environmental impact assessment report which shall be of a standard to satisfy the requirements of the Department of the Environment, Malaysia as provided for under the amendments to the Environmental Quality Act.

The study shall include appropriate baseline and reconnaissance surveys to determine the impact of the dam(s) project on various ecological systems and aspects, which will include but not necessarily be limited to the followings :

- (a) Aquatic ecosystems, both riverine and within the reservoir(s) impoundment zones.
- (b) Terrestrial ecosystems on the riverine, impoundment and watershed zones.
- (c) Public health aspects, with particular reference to water-borne diseases such as schistosomiasis and zoonosis.
- (d) Archaeological and other socio-cultural aspects.
- (e) Assessment of the negative and positive effects of the project.

3.4 Finalization of Proposed Plans

The Study Team shall present a number of alternative development scenarios to enable the Government to make decisions based on an overall and multi-sided appraisal of the alternatives. The plans shall be presented in an orderly form, suitable in context, adequate in detail and explanatory in all respects for clear understanding.

The plans shall include at least one proposal which aims, as far as it is practical, at maximizing each of national economic, social, regional development and environmental objectives. The evaluation of plans shall be made both quantitatively and qualitatively, covering technical, economic, financial, social, regional development and environmental aspects.

#### 4. TIME SCHEDULE AND REPORTS

##### 4.1 Time Schedule

The Consultants shall commence work immediately upon authorization from the Government of Malaysia. The study period is scheduled to be eighteen (18) months as shown in Fig. 2.

##### 4.2 Reports

The consultants shall prepare and submit the following reports. Time of the submission for these reports are also indicated in Fig. 2.

###### (1) Inception Report

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

###### (2) Bi-monthly Progress Reports

These reports shall cover the activities of the Consultants 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 programme of work.

###### (3) Interim Report

This report is to be submitted with ten (10) months of the commencement of study and it shall contain the results of field surveys, review and reassessment of water demand and supply situation, preliminary findings of regional flood analysis and flood mitigation effects of various dams. It will also include the results of environmental baseline studies.

###### (4) Draft Final Report

This report is to be submitted within sixteen (16) months from the commencement of the study. It shall cover all the results of the study including the presentation of various alternative scenarios of the Sg. Kelantan development plans. In addition, the Consultant shall prepare a separately bounded Executive Summary Report containing a text of 3,000 to 5,000 words together with a limited number of figures, tabulations and/or photographs.

###### (5) Final Report

This report is to be submitted within one (1) month after receiving the comment from the Government of Malaysia for the Draft Final Report.



(6) Environmental Impact Assessment Report

This report is to be submitted together with the Draft Final Report and it shall cover the present environmental and ecological conditions, the base-line and reconnaissance surveys carried out and the probable impact of the project on the environment. It shall include the results of the socio-economic survey together with appropriate resettlement plans.

The inception and Bi-monthly Progress Reports are to be submitted in thirty (30) copies, while all other reports are to be submitted in 50 copies. All reports shall be in English and the metric standard is to be used for the system of weights and measures.

5. EXPERTISE REQUIRED

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

- (1) Team Leader
- (2) Hydrologist
- (3) Flood Mitigation Specialist
- (4) River Engineer
- (5) Dam Specialist
- (6) Water Resources Engineer
- (7) Construction Engineer
- (8) Structural Engineer
- (9) Surveyor
- (10) Geotechnic Specialist
- (11) Environment Specialist
- (12) Socio-economic Specialist

6. GOVERNMENT RESPONSIBILITY

To facilitate the smooth conduct of the Study, the Government of Malaysia will 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 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 appoint counterpart personnel to the Study Team during the Study period.
- (11) To provide the Study Team with suitable office space with electrical service and necessary office equipment in Kota Bharu.
- (12) To provide the Study Team with adequate means of local transport for official travel only.
- (13) To indemnify any member 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, Malaysia 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 Government and non-Governmental Organization.

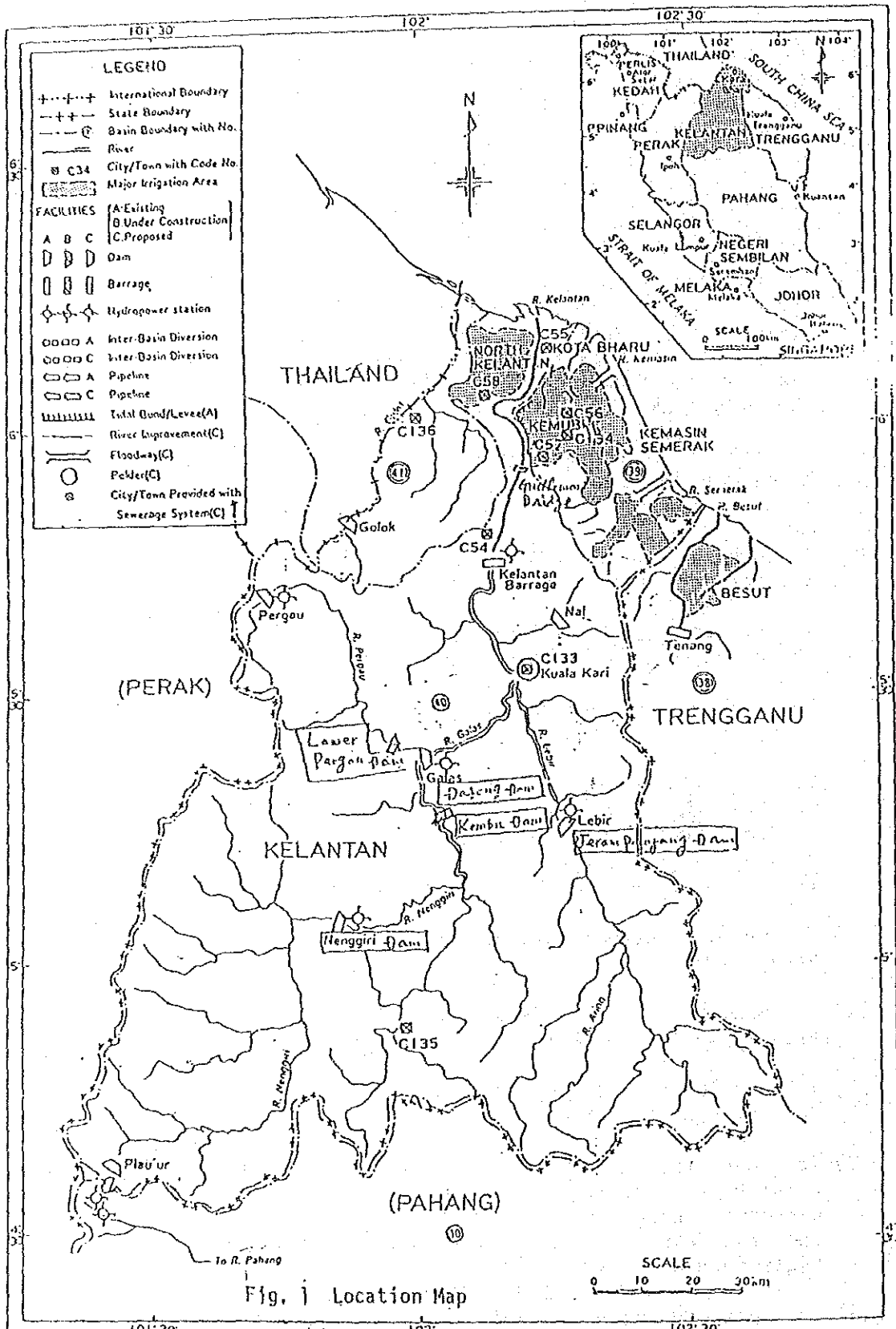


Fig. 1 Location Map

Recommended Plan  
for the State of Kelantan

GOVERNMENT OF MALAYSIA  
NATIONAL WATER RESOURCES STUDY MALAYSIA  
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 2 WORK SCHEDULE (Tentative)

| Work Item                              | 1st Year |   |       |       |       |                  |       |       |       |       |       |       | 2nd Year |       |       |       |       |       | Remarks |
|--|----------|---|-------|-------|-------|------------------|-------|-------|-------|-------|-------|-------|----------|-------|-------|-------|-------|-------|---------|
|  | 1        | 2 | 3     | 4     | 5     | 6                | 7     | 8     | 9     | 10    | 11    | 12    | 13       | 14    | 15    | 16    | 17    | 18    |         |
| <b>1. Surveys and Basic Studies</b>    |          |   |       |       |       |                  |       |       |       |       |       |       |          |       |       |       |       |       |         |
| 1.1 Review of previous studies         | =====    |   |       |       |       |                  |       |       |       |       |       |       |          |       |       |       |       |       |         |
| 1.2 Field surveys                      |          |   | ===== | ===== | ===== | =====            | ===== | ===== | ===== | ===== |       |       |          |       |       |       |       |       |         |
| a) Aerial/ground survey                |          |   | ----- | ----- | ----- | -----            | ----- | ----- | ----- | ----- |       |       |          |       |       |       |       |       |         |
| b) Hydrological survey                 |          |   | ----- | ----- | ----- | -----            | ----- | ----- | ----- | ----- |       |       |          |       |       |       |       |       |         |
| c) Flood damage survey                 |          |   | ----- | ----- | ----- | -----            | ----- | ----- | ----- | ----- |       |       |          |       |       |       |       |       |         |
| d) Geotechnical survey                 |          |   | ----- | ----- | ----- | -----            | ----- | ----- | ----- | ----- |       |       |          |       |       |       |       |       |         |
| 1.3 Water demand study                 |          |   |       |       | ===== | =====            | ===== | ===== | ===== | ===== |       |       |          |       |       |       |       |       |         |
| 1.4 Regional flood analysis            |          |   |       |       | ===== | =====            | ===== | ===== | ===== | ===== |       |       |          |       |       |       |       |       |         |
| 1.5 Socio-economic surveys             |          |   |       |       |       |                  | ===== | ===== | ===== | ===== |       |       |          |       |       |       |       |       |         |
| <b>2. Plan Formulation</b>             |          |   |       |       |       |                  |       |       |       |       |       |       |          |       |       |       |       |       |         |
| 2.1 Multipurpose dam plan              |          |   |       |       |       | Initial Planning | ===== | ===== | ===== | ===== | ===== | ===== | =====    | ===== | ===== | ===== | ===== | ===== |         |
| 2.2 Downstream flood mitigation plan   |          |   |       |       |       | Initial Planning | ===== | ===== | ===== | ===== | ===== | ===== | =====    | ===== | ===== | ===== | ===== | ===== |         |
| 2.3 Formulation of optimum plans       |          |   |       |       |       |                  |       |       |       |       |       | ===== | =====    | ===== | ===== | ===== | ===== | ===== |         |
| 2.4 Resettlement proposals             |          |   |       |       |       |                  |       |       |       |       |       | ===== | =====    | ===== | ===== | ===== | ===== | ===== |         |
| <b>3. Environmental Assessment</b>     |          |   |       |       |       |                  |       |       |       |       |       |       |          |       |       |       |       |       |         |
| 4. Finalization of Proposed Plans      |          |   |       |       |       |                  |       |       |       |       |       |       |          |       |       |       |       |       |         |
| <b>Reports:</b>                        |          |   |       |       |       |                  |       |       |       |       |       |       |          |       |       |       |       |       |         |
| Inception Report                       |          |   | ▽     |       |       |                  |       |       |       |       |       |       |          |       |       |       |       |       |         |
| Interim Report                         |          |   |       |       |       |                  |       |       |       |       | ▽     |       |          |       |       |       |       |       |         |
| Final Report                           |          |   |       |       |       |                  |       |       |       |       |       |       |          |       |       |       | ▽     | ▽     |         |
| Environmental Impact Assessment Report |          |   |       |       |       |                  |       |       |       |       |       |       |          |       |       |       | ▽     | ▽     |         |
| Bi-monthly Progress Report             |          |   |       |       | ▽     | ▽                | ▽     | ▽     | ▽     | ▽     | ▽     | ▽     | ▽        | ▽     | ▽     | ▽     | ▽     | ▽     |         |

## 2. SCOPE OF WORK

SCOPE OF WORK

FOR

STUDY

ON

KELANTAN RIVER BASIN-WIDE FLOOD MITIGATION

AGREED UPON BETWEEN

THE ECONOMIC PLANNING UNIT

OF

THE PRIME MINISTER'S DEPARTMENT

ON BEHALF OF


THE GOVERNMENT OF MALAYSIA


AND

THE JAPAN INTERNATIONAL COOPERATION AGENCY

KUALA LUMPUR

NOVEMBER 26, 1987

  
\_\_\_\_\_  
(Mr. Helmi B. Mohd Noor),  
DEPUTY DIRECTOR GENERAL  
ECONOMIC PLANNING UNIT  
PRIME MINISTER'S DEPARTMENT  
ON BEHALF OF  
THE GOVERNMENT OF MALAYSIA

  
\_\_\_\_\_  
(Mr. Masahide Tamura)  
LEADER OF THE JAPANESE  
PRELIMINARY SURVEY TEAM  
ON BEHALF OF  
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 Study of Kelantan River Basin-wide Flood Mitigation (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. OBJECTIVE OF THE STUDY

The objective of the Study is to formulate a basin-wide flood mitigation plan for the Kelantan river basin in the State of Kelantan.

## III. STUDY AREA

The Study Area shall cover the whole Kelantan river basin.

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IV. SCOPE OF THE STUDY

1. Data collection and review of previous studies

- (1) Topographical data and maps, as well as longitudinal and cross-sectional maps of the main rivers and its tributaries
- (2) Hydrological, meteorological and geological data
- (3) Existing river conditions including river environment
- (4) Socio-economic conditions of the Study area
- (5) Development policy and programmes of the Study area
- (6) Existing flood mitigation plans and projects
- (7) Existing water resources development plan and project
- (8) Existing regional development plans and projects
- (9) Present and future land use
- (10) River and its water utilization
- (11) Past flood and their damages
- (12) Other related data and information

2. Field reconnaissance

3. Field survey

- (1) Topographical survey
- (2) Geological reconnaissance and survey
- (3) Flood damage survey
- (4) Construction material survey

4. Analysis

- (1) hydrological and hydraulic analysis
- (2) flood damage analysis
- (3) socio-economic and environmental aspect

5. Identification of the major structure sites

6. Formulation of the master plan

- (1) setting up basic factors
- (2) basic layout of major structures
- (3) preliminary design of major structures
- (4) examination of the preliminary engineering feasibility of selected major structures
- (5) examination of the feasibility of non structural measures
- (6) construction plan
- (7) estimation of construction cost and operation and maintenance
- (8) estimation of benefits
- (9) economic and financial evaluation
- (10) programme and organization for operation and maintenance
- (11) socio-economic and environmental impact

V. STUDY SCHEDULE

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



VI. REPORTS

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

1. Inception Report

Thirty (30) copies within one (1) month from the date of the commencement of the Study.

2. Progress Report

Thirty (30) copies within four (4) months from the date of the commencement of the Study.

3. Interim Report

Thirty (30) copies within ten (10) months from the date of the commencement of the Study.

4. Draft Final Report

Thirty (30) copies within fourteen (14) months from the date of the commencement of the Study. The Malaysian Government will provide the Study Team with their comments within one (1) month after receipt of the Draft Final Report.

5. Final Report

Hundred (100) copies within two (2) months after the Draft Final Report. All comments given by the Malaysian Government will be compiled in the preparation of the final report.

The Study Team should ensure that all data, information maps, materials 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 ensure the necessary entry permits for the Study Team to conduct field surveys in Malaysia and exempt them from consular fees.
3. To exempt the members of the Study Team from axes and duties, as normally accorded under 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, 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.
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 equipment in Kota Bharu and Kuala Lumpur.

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12. To provide the Study Team with adequate means of local transport for official travel only.
13. To indemnify any member 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 counterpart agency for the Study and the Economic Planning Unit as the main coordinating body in relation to other relevant governmental and non-governmental organizations.

#### VII. 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

| ITEM              | MONTH | 1      | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10     | 11    | 12    | 13    | 14     | 15 | 16 | 17    |
|-------------------|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|--------|-------|-------|-------|--------|----|----|-------|
| STUDY IN MALAYSIA |       | =====  | ===== | ===== | ===== | ===== | ===== | ===== |       |       | =====  |       |       |       |        |    |    |       |
| STUDY IN JAPAN    |       | =      |       |       |       | ===== | ===== | ===== | ===== | ===== |        | ===== | ===== | ===== | =====  |    |    |       |
| REPORT            |       | △ IC/R |       |       | △ P/R |       |       |       |       |       | △ IT/R |       |       |       | △ 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

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### 3. MINUTES OF MEETING

Minutes of Steering Committee Meeting

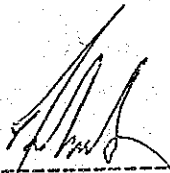
for the Study

on the Kelantan River Basin-wide

Flood Mitigation


November 26, 1987

Kuala Lumpur, Malaysia



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(Mr. Helmi Mohd. Noor)  
Deputy Director General,  
Unit Perancang Ekonomi,  
Prime Minister's Department,  
on behalf of  
the Government of Malaysia



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(Mr. Masahide Tamura)  
Leader of the Japanese  
Preliminary Survey Team  
on behalf of  
the Japan International  
Cooperation Agency

Minutes of Steering Committee Meeting  
held on 26 November, 1987 in the  
Economic Planning Unit, Kuala Lumpur

1. Objective

The meeting was convened to discuss the proposed Scope of Work for the Study on the Kelantan River Basin-wide Flood Mitigation.

2. Attendance

The list of attendance is as shown in Annex I

3. Opening Remarks

The Chairman of the Steering Committee welcomed the members of the JICA Survey Team from Japan, and also the members of the Steering Committee. He informed the meeting that the Government of Malaysia places great importance on flood mitigation in the Kelantan River Basin due to the great losses in properties and human lives caused by annual floods. He expressed the hope that the Study will result in practical solutions to the flood problem in Kelantan so that concrete project proposals can subsequently be drawn up and implemented.

Mr. Tamura, Leader of the JICA Team informed the meeting that the purpose of the Team's visit to Malaysia was to discuss the framework of the Study with Malaysian officials and to conclude the Scope of Work. He thanked the Malaysian

counterparts for organizing the field reconnaissance survey to enable the Team to collect some necessary information for the Study and to visit the Study area. Mr. Tamura also expressed the hope at the Study will result in a comprehensive flood mitigation Master Plan for the Kelantan River Basin.

4. Comments on Scope of Work

The following comments and questions were raised:-

- 4.1 The Chairman noted that the JICA Team will base their Study on existing data only and enquired as to whether this will pose any constraint in their recommendation of suitable major structures. The Japanese side conceded that if additional geological survey were to be carried out, it will definitely facilitate the preparation of the Study to feasibility level within the Master Plan. This being the case, the Malaysian side agreed to consider funding the survey of one site if deemed necessary. The Japanese side then agreed to include a geologist in the Study Team to ascertain the necessity. As it can only be carried out at the beginning of the fourth month after the initial investigation, the JICA Team also agreed to adjust the Study schedule by extending the stay in Malaysia to the seventh month.

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- 4.2. The Malaysian side noted that the present Scope of Work does not provide for a second phase whereby one project from the Master Plan is prepared to feasibility level. The meeting was informed that the Study will be carried out to Master Plan level and hence it was too early to progress to feasibility stage. The Study will however, include to prefeasibility level, the selected major structures identified. The meeting accepted this proposal as a compromise.
- 4.3. The meeting discussed on the possibility of changing the objective in the Scope of Work so as to make it similar to that of the Terms of Reference, particularly with respect to the need to consider water resources aspects. The meeting was informed that the two documents served different purposes and that the Scope of Work is a document to be agreed upon between the two parties and should preferably be of a more general nature. After some discussion, it was agreed to retain the objective as stated in the Scope of Work, but it was agreed that the Study take into account existing water resources development plans and projects.
- 4.4. With respect to the environmental impact assessment, the JICA Team informed the meeting that the assessment of the environment should be done by the Malaysian side. The Study will however, consider any changes and/or influences to the environments as a result of proposed works within the master plan. Also, the benefits or costs of such impacts will not be included in the cost estimate and economic analysis at master plan level.
- 4.5. On Item 3(1), the JICA Team indicated that surveys will be required for about 90 to 100 km. of river with cross-sections at every kilometre. Due to limited funds available, the Malaysian side requested the Japanese side to

consider including this item to be funded by JICA. The Malaysian side will undertake the cross-sectional survey at the existing gauging stations. This is estimated to represent approximately 5% of the total cross-sectional surveys required. The JICA Team stated that the request from the Malaysian side will be conveyed to the relevant authorities in Japan and will be discussed for consideration after their return to Japan.

- 4.6 The meeting agreed to include a new item 6(5) which reads "examination of the feasibility of non-structural measures". In this context, non-structural measures are measures such as flood warning, flood forecasting, flood zoning, legislation and other measures that do not require major engineering works.
- 4.7 The meeting requested that in the formulation of the master plan, a number of alternatives/scenarios should be studied. This should include an alternative whereby no major structures are proposed, an alternative with the full development of all major structures necessary to mitigate the flood problem, and a number of alternatives with various combinations of the major structures. The JICA Team agreed to this request.
- 4.8 With regards to the proposed schedule, the meeting noted that the reports will be submitted at the end of each period of Study in Malaysia. The JICA Team explained that the Study Team will submit drafts of these reports when they come to Malaysia and these drafts would be discussed with the Malaysian side and amended before the reports are formally submitted as indicated in the schedule.

- 4.9 The Malaysian side requested for an early start to the Study so as to tie in with the Lebir Study. The JICA Team took note of the request.
- 4.10 The meeting pointed out that the period of Study in Malaysia at the beginning of the Study would involve mainly data collection. In order to have meaningful transfer of technology, the Chairman proposed that the period of study in Malaysia should be increased so as to cover other aspects in the formulation of the master plan. The JICA Team agreed to increase the period of study in Malaysia by three months during which, part of the Study Team will be in Malaysia to train the local counterpart officers.
- 4.11 The Malaysian side agreed to make arrangements for the Study Team to use in Japan, data, maps and other materials connected with the Study. However, to comply with the Malaysian security requirements, these arrangements will be subjected to some conditions to be imposed.
- 4.12 On Item VIII, EPU requested that the technology transfer should include training in Japan for Malaysian counterpart personnel involved in the Study. The JICA Team took note of the request.
- 4.13 The Malaysian side requested for a Training Seminar near the end of the Study to disseminate information and training on the methodology of the Study to Malaysian officers from various departments and agencies. The JICA Team took note of the request.
- 4.14 The Malaysian side hoped that the master plan to be formulated will take into account the need to reduce inundation of developed areas and to minimise adverse impacts on orang asli, wildlife and the environment.

The Chairman of the meeting and the Leader of the JICA Preliminary Survey Team then signed the agreed upon Scope of Work for the Study. In conclusion, the Chairman thanked the members of the meeting for their attendance and contribution. He then adjourned the meeting.

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ATTENDANCE LIST

JAPANESE SIDE

Japanese Preliminary Survey Team

1. Mr. Masahide Tamura - Leader
2. Mr. Masanori Shinagawa - Member (Dam Planning)
3. Mr. Toshihiro Yoshimoto - Member (River Planning)
4. Mr. Teruaki Yamada - Member (Flood Mitigation)
5. Mr. Kazuo Nakagawa - Member (Cooperation Planning)

Embassy of Japan

6. Mr. Hirofumi Ohnishi

JICA Office in Malaysia

7. Mr. Takao Matsuzaki
8. Mr. Keizo Kagawa

MALAYSIAN SIDE

1. Mr. Helmi B. Mohd Noor - Deputy Director General  
Economic Planning Unit
2. Ir. Joseph Yeoh Hoh Hoh - Drainage and Irrigation  
Department, Headquarters.
3. Ir. Lim Teik Keat - Drainage and Irrigation  
Department, Headquarters.

4. Ir. Tadatoshi Matsuishi - Drainage and Irrigation Department, Headquarters.
5. Ir. Anran Mohd Yosuff - Drainage and Irrigation Department, Kelantan.
6. Ir. Wan Yahya Hj. Wan Salleh - State Economic Planning Unit, Kelantan.
7. Ir. Yeap Nie Tian - Public Works Department, Headquarters.
8. Ir. Tan Yan Fatt - Public Works Department, Kelantan.
9. Ir. Soh Chak Yuen - National Electricity Board
10. Ms. Lin Mui Kiang - Economic Planning Unit
11. Ms. Wong Peg Har - Economic Planning Unit
12. Mr. Latib B. Markom - Economic Planning Unit.

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#### 4. 基礎資料の賦存状況

##### QUESTIONNAIRE

|   | presence | owner's name     | remarks                 |
|---|----------|------------------|-------------------------|
| <b>I. General</b>   |          |                  |                         |
| 1. National development plan<br>(Existing long-term plan or 5 year plan of DID) |          | UPEN<br>DID • HO |                         |
| 2. State development plan (Kelantan)  |          | DID • KEL        | 1986 - 1990             |
| 3. Budget in recent 5 years   |          |                  |                         |
| (a) Budget for flood mitigation   |          |                  |                         |
| ① National level  |          | DID • HQ         |                         |
| ② State level   |          | DID • KEL        | 1980 - 1985             |
| (b) Budget of DID   |          |                  |                         |
| 4. Name of agency related to this study   |          | UPEN /           |                         |
| (a) Name of agency  |          | DID / PWD        |                         |
| (b) Address   |          | KBSEDAR /        |                         |
| (c) Telephone number  |          | FELCRA           |                         |
| (d) Name of person in charge (DIRECTORS)  |          | FORBST DBPT      |                         |
| <b>II. Technical</b>  |          |                  |                         |
| 1. Aerial photographs   |          | SURUEY DBPT      |                         |
| (a) Area covered  |          | K • L •          |                         |
| (b) Date of photo taking  |          |                  |                         |
| 2. Topographic maps   |          |                  | Whole belanta<br>State  |
| (a) Area covered by the above maps  |          |                  | 1; 25,000               |
| (b) Scale   |          |                  | 1; 63,360               |
| (c) Interval of contour line  |          |                  | 50' - 500'              |
| (d) Date of mapping out   |          |                  | 1955, 1967,<br>1974/ 75 |
| 3. Old maps<br>(historical change of Kelantan river course)                     |          | SURUEY DBPT      |                         |
| 4. Profile of longitudinal survey   |          | DID • KEL        | 24 X- Sechus by<br>ENRX |
| (a) Section of longitudinal survey  |          |                  | Uories                  |
| (b) Interval of survey point  |          |                  | 1975                    |
| (c) Date of survey  |          |                  |                         |
| 5. Cross-section of river bed   |          | DID • KEL        | BY ENEK                 |
| (a) Map showing survey points   |          |                  | bct S ' - 69'           |
| (b) Interval of survey points   |          |                  |                         |
| (c) Date of survey  |          |                  |                         |

|  | presence | owner's name | remarks     |
|--|----------|--------------|-------------|
| 6. Data on fluctuation of river bed          |          |              |             |
| 7. Geological map covered the target area    |          | CEOLOCY      |             |
| (a) Scale                                    |          | DBPT         |             |
| (b) Date of mapping out                      |          |              |             |
| 8. Hydrological data                         |          | DID • KBL    |             |
| (a) Rainfall                                 |          |              |             |
| ① Location of observatory                    |          |              |             |
| ② Period of observation                      |          |              | Since 1932  |
| ③ Record of rainfall                         |          |              |             |
| (b) Discharge (Water-level)                  |          | DID • KBL    |             |
| ① Location of observatory                    |          |              |             |
| ② Period of observation                      |          |              |             |
| ③ Record of discharge/water-level            |          |              |             |
| (c) Sea level                                |          |              |             |
| ① Location of observatory (TUMPAT)           |          |              |             |
| ② Period of observation                      |          |              |             |
| ③ Record of sea level                        |          |              |             |
| 9. Meteorological data                       |          | M • M, S •   |             |
| (a) Location of observatory                  |          | SUBANC       |             |
| (b) Annual precipitation                     |          |              |             |
| (c) Annual evaporation                       |          |              |             |
| (d) Monthly total precipitation              |          |              |             |
| (e) Temperature                              |          |              |             |
| 10. Records of natural disaster              |          | DID • KBL    | 1965 - 1986 |
| in the objective area (Flood, erosion, etc.) |          |              |             |
| (a) Occurrence year                          |          |              |             |
| (b) Cause                                    |          |              |             |
| (c) Damage area                              |          |              |             |
| (d) Condition of damage                      |          |              |             |
| 11. Master plan of flood mitigation          |          | DID • K • L  |             |
| in Kelantan river basin                      |          | DID • KBL    |             |



|  | presence | owner's name | remarks |
|--|----------|--------------|---------|
| 12. Existing facilities related to flood mitigation  |          | DID • KBL    |         |
| (a) List indicated the following items ;<br>(leuce) & groyue P. lras & Kg. Kedai Buluh ; 1978 & 1987 |          | DID • KBL    |         |
| ① Type of works  |          |              |         |
| ② Location   |          |              |         |
| ③ Construction year  |          |              |         |
| ④ Construction material  |          |              |         |
| ⑤ Dimention (H, L, )   |          |              |         |
| ⑥ Design discharge   |          |              |         |
| ⑦ construction cost  |          |              |         |
| ⑧ operation and maintenance cost   |          |              |         |
| ⑨ organization   |          |              |         |
| ⑩ scdimentation  |          |              |         |
| (a) Figure of structure  |          |              |         |
| (b) Damaged condition of existing facilities   |          |              |         |
| 13. Socio- economic condition around Kelantan river basin  |          |              |         |
| (a) Administratrative district   |          |              |         |
| (b) Population   |          |              |         |
| (c) Land use (present and future)  |          |              |         |
| (d) Infrastructure   |          |              |         |
| (e) Industry   |          |              |         |
| (f) agriculture  |          |              |         |
| 14. Warning /evacuation system   |          |              |         |
| (a) Outline of the system involving the following matters ;  |          |              |         |
| ① Organization for information system  |          |              |         |
| ② Facilities and those arrangement   |          |              |         |
| ③ Transmission means   |          |              |         |
| (b) Actual state of warning /eveacuation   |          |              |         |
| (c) Zoning of hazard   |          |              |         |
| 15. Riverbed material and its utilization  |          |              |         |

|  | presence | owner' s name                         | remarks |
|--|----------|---------------------------------------|---------|
| 16. Water utilization<br>(City water , Industrial water ,<br>Irrigation water , etc.)<br>Annual change of water demand<br>Facilities (Water resources , intake)<br>Draught condition |          | KADA<br>DID • KBL<br>DID • KBL<br>PWD |         |
| 17. Unit price and wages of construction<br>workers<br>(Cement , aggregate , stone , gabion ,<br>flame , wood , dynamite , fuel , etc.)  |          | DID • KBL                             |         |
| 18. Water quality  |          | DID • KBL                             |         |
| 19. Environment  |          |                                       |         |

## 5. 面談者リスト

### Economic Planning Unit (EPU)

|                          |  |
|--------------------------|--|
| Mr. Helmi Bin Mohd. Noor | Deputy Director General                      |
| Mrs. Lin Mui Kiang       | Principal Asst. Director of Agriculture Sec. |
| Mrs. Wong Peg Har        | Principal Asst. Director of E.A. Sec.        |
| Mr. A. LATIB MARROM      | Assistant Director                           |

### Kelantan State Economic Planning Unit (SEPU)

Mr. Hashim Bani Hamid Director  
Mr. Wan Yahya Hj. W. Salleh Representative of Director

### Drainage & Irrigation Department (DID)

|                                 |                          |
|---------------------------------|--------------------------|
| Mr. Haji Shahrizaila B. Abdulah | Deputy Director General  |
| Mr. D.N. Welch                  | Asst. Director General   |
| Mr. Sich Kok Chi                | Chief Engineer           |
| Mr. Quah Tek Hoe                | Design Chief Engineer    |
| Mr. Lim Teik Keat               | Water Resources Engineer |
| Mr. Tadatoshi MATSUISHI (松石忠俊)  | Expert                   |

JICA

### Kelantan State DID

|                        |                         |
|------------------------|-------------------------|
| Mr. Amran Mohd. Yusoff | Deputy Director General |
| Mr. Song Teng Hock     | Senior Technical Asst.  |

### Kelantan South Development Authority (KESADAR)

Dr. Nik Ibrahim bin Nik General Manager  
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|                              |                 |
|------------------------------|-----------------|
| Mr. Hiroshi HASHIMOTO (橋本 宏) | Minister        |
| Mr. Hirofumi OHNISHI (大西 博文) | First Secretary |

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|                             |                               |
|-----------------------------|-------------------------------|
| Mr. Takao Matsuzaki (松崎 孝雄) | Resident Representative       |
| Mr. Keizo KAGAWA (香川 敬三)    | Asst. Resident Representative |

**timesnational**

# Study into ways to end Kelantan floods

**KUALA LUMPUR, Fri.** — A Kelantan River basin flood mitigation study is to be undertaken as up to 700,000 people in Kelantan will be affected by floods if immediate steps are not taken to alleviate the problem.

Severe flooding has also retarded development in the State, causing damage running into tens of millions of ringgit.

In view of this, the Economic Planning Unit of the Prime Minister's Department signed an agreement with the Japan International Co-operation Agency (JICA) yesterday to do a flood mitigation study in the basin.

The objective of the 17-month study, scheduled to begin next March, is to formulate a master plan for the flood mitigation project.

Once completed, the study is expected to propose the construction of dams and river channel improvement which includes deepening and widening the river and diverting the flow.

The study — the second major one undertaken in Malaysia by JICA — is sponsored by the Japanese Government.

Another JICA team is now doing a \$5 million flood mitigation study of the Klang River basin with the aim of alleviating the problem in this highly urbanised area within 10 years.

The *New Straits Times* reported on Nov 6 that the options in this study include the diverting of rivers away from urbanised areas and linking them with disused mining pools, which are to be converted into water retention ponds.

The leader of the team under-



**MR TAMURA**

taking the preliminary study team for the Kelantan project, Mr Masahide Tamura, told a Press conference today that some 250km of river will be involved in the study.

"The study area is about 13,000 sq km, which is virtually the entire State of Kelantan," he said.

## Pressing need

Mr Tamura said his team will leave for Japan soon where a work schedule and other matters will be finalised before the actual study begins in March.

He said the Kelantan River basin is one of the most flood-prone regions in Malaysia.

This, he said, is caused by periodic torrential rainfall and the overflow from the Kelantan River, which floods Kota Baru and widespread reaches of the downstream area.

"There is a pressing need to regulate the flow of the Kelantan River, especially after the 1982 floods."

Among the major disasters in the State was the 1967 floods which inundated 200,000 hectares of the coastal area and affected about 300,000 people. Water levels then reached a height of six metres.

Mr Tamura said the study will also involve Japanese environmental experts and Drainage and Irrigation Department engineers, who will be involved in the technology transfer aspect of the project.

He said the study team will spend a portion of the 17-month period doing surveys and collecting data from people living along the river banks as existing data is not extensive.

JICA is the official agency responsible for conducting the technical co-operation programmes of the Japanese Government.

Other members of the preliminary study team are Mr Masanori Sinagawa, an expert in dam planning; Mr Toshihiro Yoshimoto (river planning); Mr Teruaki Yamada (flood control); and Mr Kazuo Nakagawa (co-operation planning).

JICA has also been involved in flood mitigation programmes in China, Indonesia and Bangladesh.

# Jica to carry out study on Kelantan River basin

By AZAM ARIS

THE Japan International Cooperation Agency (Jica) will carry out its second study on Malaysian river basins and this time the focus will be the Kelantan River basin.

The study when completed will provide the Government with a Master Plan for basin-wide flood mitigation in Kelantan. Jica at the moment is sponsoring a similar study on the Klang River basin.

Mr Masahide Tamura, leader of the preliminary survey team currently in the country, said the study is expected to begin in March next year and will be completed within 17 months.

The Kelantan River basin is one of the most flood prone regions in Malaysia. Periodically severe flooding caused by a

combination of torrential rainfall and the overflow from the Kelantan River seriously affects Kota Baru development.

"The flood threat has always been an obstacle to progress in the state. Since 1982 there has been a pressing need to re-examine the proposals regulating the Kelantan River," he said in Kuala Lumpur yesterday.

He added that due to this the Malaysian Government had requested Japan to prepare a basin wide flood mitigation plan for the Kelantan River basin.

The study, he said, will cover an area of 13,00 sq km involving 700,000 people.

During their visit the team will discuss the framework of the study with officials at the Economic Planning Unit

(EPU), conclude the scope of work, collect necessary data and survey the study areas.

In their study, the team will include two important flood control measures that can be implemented namely flood discharge regulations by dams and river channel improvement.

"The Kelantan River is about 250 km long. To improve flood control measures such as river diversion, the construction of dams and the prevention of erosion of river banks should be taken," he said.

Other members of the team include dam planner Masanori Sinagawa, river planner, Mr Toshihiro Yoshimoto, flood controller, Mr Teruaki Yamada and cooperation planner, Mr Kazuo Nakagawa.

# 根治丹州水患 日專家伸援手

## 初步調查結束。明初着手研究

(吉隆坡廿七日訊)日本國際合作機構料將於明年三月開始，全面研究解決吉蘭丹州流域水患的情況。

這項研究相信將在十七個月時間內完成。

日本國際合作機構的一支代表團，將於本月十九

日對這個問題進行初步調查，並已於昨日完成任務。

該代表團團長田村正秀今日在此間日本大使館舉行的一項報界招待會上說，這項調查的目的，是要擬定一份大藍圖，以解決吉蘭丹州流域水患的情況。

他指出，在進行研究時，該代表團考慮兩個途徑，即建立水壩排水和改善水道。

他表示，該代表團此行的目的，包括與大馬官員討論這項研究的結構，擬定工作的範圍，收集供研究的必需資料和調查研究地區。

田村正秀說，該代表團已於昨日與首相署經濟策劃組副總監海米會談。

該代表團是在大馬政府的要求下，前來我國。

受研究的吉蘭丹州流域，是大馬常受水患侵襲的地區。

嚴重的水患，一直妨礙該州的發展，為了解決這個問題，大馬政府要求日本政府為吉蘭丹州流域擬定一份解決水患的計劃。

## 吉蘭丹河盆地時常泛濫影响發展 大馬已尋求日本援助

### 釐定防治計劃大藍圖

〔吉隆坡廿八日訊〕 前天，首相署经济定期性的宣泄成灾水  
) 马来西亚已寻求日本 策划组已和这支负责队 流；改善河流的流道及  
援助厘定吉兰丹河盆地 伍签署了研究协议书。 环境生态问题。  
泛濫防治計劃大藍圖。 这支在本月十九日 田村表示，吉兰丹  
负责这个任务的一 抵步的五人队伍已和大 州河盆地是马来西亚境  
支日本队伍领导人田村 马官员讨论了研究的纲 内泛濫最频繁的地方之  
昌英昨天在报界招待会 领及工作的范围。 一，而且，泛濫也阻碍  
上说，日本的調查队定 田村表示，研究预 了州的进展。  
在明年三月展开计划的 料需费时十七个月，范 调查及研究遍及的  
初步调查工作。 围包括考虑采用水坝作 地区广达一万三千平方

公里，包括哥打峇魯、  
活望生及吉賴三个拥有  
七十万总人口的主要城  
市。

田村说：「有鑒於  
一连串的泛濫已严重影  
响到州的情况及认为有  
必要检讨吉兰丹河道的  
控制建议，马来西亚政  
府决定要求日本厘定一  
份泛濫防治計劃大藍  
圖。吉兰丹河盆地防治  
計劃大藍圖的調查研究  
是由日本国际合作机构  
赞助。

这个机构也是负责  
执行日本政府技术合作  
計劃的官方组织。

--- Press Release No. 46/87 (25-11-87)

# 光華日報

KWONG WAH YIT POH & PENANG SIN POE

## 日本政府允助我 明年派專家前來

### 研究緩和丹水患問題

駐隆記者廿七日訊：日本政府經答應我國政府之要求，同意於明年三月派遣一批專家到來我國研究緩和吉蘭丹河流域常年一雨成災之問題。

這批日本技術專家是以日本國土廳水資源調查室長田村正秀為首，另四名成員是：日本國土發展技術研究中心參事品川正典，日本建設省土木研究所預防水災中心主任吉本俊裕，日本建設省國際課洪水管理課長補佐山田皓章及國際協力事業團開發課二課中川和夫。

這批五人研究小組將於明年三月展開研究工作，預料他們將會在十七個月後完成工作，並提呈一份有關如何緩和吉蘭丹河流域水患問題之大藍圖。

田村正秀今日在日本大使館召開一項記者招待會時指出，吉蘭丹河流域面積大

約一萬三千公里，該河長達二百五十公里。

他指出，鑒于吉蘭丹主要城市如哥打峇魯、瓜拉庇來及活望生自一九八二年以來不斷發生嚴重水災，受影響人口達七十萬名，因此，大馬政府首相署經濟策劃局特要求日本政府給予援助，以展開上述研究工作及提呈應付對策。

他說，他們曾於昨日與我國首相署經濟策劃局副總監哈米莫哈末進行會談，討論有關研究事宜。問及有關研究所將涉及的費用，他表示目前難以下定，必須等待完成有關報告書後才可估計。



## 日本專家出馬策劃 丹河氾濫有望解決

(吉隆坡廿七日訊)  
我國已尋求日本協助，  
以制訂克服水患大藍圖，  
控制吉蘭丹河盆地的  
水患問題。

日本勘察表團團長田  
村正秀說，日本研究隊  
將於明年三月，到吉蘭  
丹盆地進行研究工作，  
為這項大藍圖收資料。

田村正秀今日在日本  
大使館的一項記者會上  
對記者說，他們昨日經

已和首相署經濟策劃組  
副主任荷米莫哈末諾簽  
署了一項研究合約。

他說，這項研究工作  
預料將花費十七個月，  
並將考慮以建造水閘，  
改造河道及其他方法控  
制水災。

他說，受研究的盆地  
地區面積為一萬三千平  
方公里，包括了哥打峇  
魯，話望生及吉頓三個  
主要城鎮，影響及約七  
十萬人。

田村正秀說，隨着水  
患嚴重影響州內的發展

及需要克服吉蘭丹河水  
患問題，大馬政府經已  
要求日本協助，以制訂  
緩和及控制水患的計劃。  
他說，他們在研究各  
種改善及克服水患的方  
法時，也將採用本地的  
某些資料，如地理及人  
口資料輔助。

他說，他們會在研究  
工作完畢後，針對吉蘭  
丹河盆地的水患情況，  
草擬一項大藍圖。



日本勘察團團長田村正秀(左二)向記者解說他們到大馬  
所做的研究工作。

Utusan Malaysia, Sabtu 28 November, 1987

## Malaysia minta Jepun bantu rumus pelan induk kawal banjir di Kelantan

**KUALA LUMPUR** 27 Nov. — Malaysia telah meminta bantuan Jepun untuk merumuskan pelan induk mengenai kawalan banjir di Lembah Sungai Kelantan.

Ketua kumpulan kajian awal pelan itu, Masahide Tamura, memberitahu persidangan akhir di sini hari ini, kajian bagi merumuskan pelan induk itu akan bermula pada bulan Mac tahun depan.

Persetujuan mengenai ditandatangani di sini semalam antara kumpulan itu dan Unit Perancang Ekonomi, di

Jabatan Perdana Menteri (JPM).

Kumpulan lima anggota itu, yang tiba di sini pada 19 November lalu, sebelum itu telah berbincang dengan beberapa orang pegawai Malaysia mengenai peraturan dan skop kerja.

Encik Tamura berkata, kajian itu yang dijangka dijalankan dalam masa 17 bulan akan mengambil kira memperbaiki terusan-terusan di sungai dan aspek persekitaran.

Menurut beliau, Lembah Sungai Kelantan ialah satu daripada kawasan

di Malaysia yang mudah dilanda banjir dan ancaman banjir merupakan halangan ke arah kemajuan negeri itu.

Katanya, kajian mencakupi kawasan seluas

13,000 kilometer persegi di Lembah Sungai Kelantan, termasuk tiga bandar utama iaitu Kota Bharu, Gua Musang dan Kuala Krai Bernama.





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