5-3 環境予備調査の結果

（1） スクリーニング

以下に示す理念に基づいた具体的な視点によって、環境インパクト調査の実施が必要となる開発プロジェクトか否かの判断を行う。

(1) スクリーニングの理念

- 開発計画が関連住民の生存、生活に悪影響を与えないようにし、地域の持続的な開発・発展を確保しつつ、社会生活に十分な便益を持たらすようにする。
- 開発計画が現況の自然環境を著しく損なわず、また貴重な環境および自然資源を保全し、将来にわたって調和の取れた環境を維持する。

(2) プロジェクト概要

表5-1にプロジェクト概要を示す。

(3) プロジェクト立地環境

表5-2にプロジェクト立地環境を示す。

(4) スクリーニング

表5-3にスクリーニングの結果を示す。

スクリーニングの結果より、影響を受ける恐れのある項目があり、マスタープラン（M／P）の策定においてIEE（初期環境評価）を、また、フィージビリティスタディ（F／S）においてEIA（環境影響評価）を実施すべきであると判断した。

（2） スコーピング

開発プロジェクトの考え得る環境インパクトのうち、重要と思われるものを見出し、それらを踏まえた上で環境インパクト調査の重点分野あるいは重点項目を明確にする。

ガイドラインに従ったスコーピングのためのチェックリストを用いるに際しては、次に示す検討条件を踏まえることとし、表5-4にスコーピングチェックリストを示す。

（検討条件）

① 検討対象時期

検討対象時期は、供用開始前および供用開始後とする。

② 検討対象とする空間的範囲

空間的範囲は、施設周辺部および関連水域とする。

③ 環境インパクトの対象

環境インパクトの対象は、基本的に現況の環境に与えるマイナスの影響とする。

本プロジェクトにおける計画内容は現段階では未定であるが、各河川における計画案は、それぞれの自然的・社会的および環境的な特性を考慮に入れた対応策、即ち、築堤、

護岸、河床の浚渫・掘削等の河川改修およびダム等の貯留施設を組み合わせた計画案が策定されるものと推測される。

これらの計画案に対応した施設が建設されることを前提に、現段階では未定の事項に関する項目や、関係者からのヒアリングでは確認できなかった項目に関する評定は困難であるが、環境へのインパクトが見込まれる項目、もしくは不明な環境項目を示すと、住民移転、湖沼、河川流況、地域分断、遺跡・文化財、水利権・入会権、廃棄物、地形・地質、地下水、海岸・海域、動植物、景観および水質汚濁等である。

以上の検討結果をまとまた総合評価を表5-5に示す。

なお、インドネシア国における環境影響評価制度により、Ｆ／Ｓ調査対象のプロジェクトがＡＮＤＡＬ調査を実施するプロジェクトに該当するかどうか、また、ＡＮＤＡＬ調査を実施する必要があるプロジェクトに該当とした場合には、そのＴＯＲの承認手続きなどはＦ／Ｓ調査開始前に完了しておく必要がある。本承認手続きなどが予定どおりに完了されていない場合、Ｆ／Ｓ調査の全体工程に支障が生じるため、公共事業省と十分にＡＮＤＡＬ調査に関する事項について協議を行っておく必要がある。

表5-1　プロジェクト概要のフォーマット　「河川・砂防」

項　目	内　容
プロジェクト名	アンボン・パサハリ地区洪水対策計画調査
背　景	アンボン市は洪水の常襲地帯となっており、集中豪雨のたびに深刻な被害を受けている。アンボン市は公共事業省住宅総局により都市再開発計画が作成済みであるが、治水対策については現在策定されておらず、東部インドネシア開発の拠点における都市基盤整備の一環としてアンボン市の総合的な洪水対策計画の策定が急務となっている。一方、パサハリ地区は、現在灌漑事業が推進されているが、アンボン地区と同様に、灌漑地区に対する治水対策が未整備であることから、当地区に対する治水対策計画の策定が望まれている。
目　的	アンボン地区及びパサハリ地区に対する主要７河川流域に係る治水対策計画を策定する。
位　置	インドネシア共和国　ｱﾝﾎﾞﾝ島５河川流域及びｾﾗﾑ島２河川流域
実施機関	公共事業省
裨益人口	アンボン島５河川流域人口約４万人 セラム島２河川流域人口約１万人
計画諸元	
計画の種類	洪水・土砂災害防止
主要計画／構造物	河道改修／多目的ダム
規模	流域面積：アンボン地区 41.33 km^2 ：パサハリ地区 528 km^2 改修延長：未定 堰　堤：未定
付帯設備	未定
その他特記すべき事項	なし。

注）　記述は既存資料により分かる範囲内とする。

表5-2　プロジェクト立地環境のフォーマット　「河川・砂防」

項　目		内　容
プロジェクト名		アンボン・パサハリ洪水対策計画調査
社会環境	地域住民 (居住者／先住民／計画に対する意識等)	アンボン地区は都市型住民、パサハリ地区は農耕民。
	沿川の土地利用 (都市／農村／史跡／景勝地／病院等)	アンボン地区は都市、パサハリ地区は農耕地。
	経済／交通 (商業・農漁業・工業団地／フェリーターミナル等)	アンボン市はマルク州の州都。
自然環境	地形・地質 (急傾斜地・軟弱地盤・地滑り地／断層等)	アンボン地区は全般的に急な傾斜地形、パサハリ地区は平坦な農耕地。
	海岸・海域 (浸食・堆砂／潮流・潮汐・水深等)	アンボン湾は穏やかな湾で、天然の良港。
	貴重な動植物・生息域 (自然公園・指定種の生息域等)	不明。
公害	苦情の発生状況 (関心の高い公害等)	なし。
	対応の状況 (制度的な対策／補助等)	
その他特記すべき事項		なし。

注)　記述は既存資料により分かる範囲内とする。

表5-3 スクリーニングのフォーマット 「河川・砂防」

環境項目			内容	評定	備考（根拠）
社会環境	1	住民移転	用地占有に伴う移転（居住権、土地所有権の転換）	有	施設建設の用地取得が必要。
	2	経済活動	土地等の生産機会の喪失、経済構造の変化	無	
	3	交通・生活施設	舟運等既存交通や学校・病院への影響	無	発生の要因なし。
	4	地域分断	交通の阻害による地域社会の分断	不明	貯留施設の計画構想あり。
	5	遺跡・文化財	寺院仏閣・埋蔵文化財等の喪失や価値の減少	不明	存在が不明。
	6	水利権・入会権	漁業権、水利権、山林入会権等の阻害	不明	水利権の有無が不明。
	7	保健衛生	ゴミや衛生害虫の発生等衛生環境の悪化	無	発生の要因なし。
	8	廃棄物	建設廃材・残土、汚泥、一般廃棄物等の発生	不明	建設廃材・残土等の発生量が不明。
	9	災害（リスク）	地盤崩壊・落盤、事故等の危険性の増大	無	発生の要因なし。
自然環境	10	地形・地質	掘削・盛土等による価値のある地形・地質の改変	不明	地形・地質状況が不明。
	11	土壌浸食	土地造成・森林伐採後の雨水による表土流出	無	発生の要因なし。
	12	地下水	過剰揚水や涵養能力の低下による涸渇、浸出水による汚染	不明	河川水位と地下水位の関係が不明。
	13	湖沼・河川流況	埋立や放水路等による流量、流速、河床の変化	有	河川流況の変化。
	14	海岸・海域	沿岸漂砂の変化による海岸浸食や堆積	不明	現況が不明。
	15	動植物	生息条件の変化による繁殖阻害、種の絶滅	不明	生息域の状況不明。
	16	気象	大規模造成や建築物による気温、風況等の変化	無	大規模な改変なし。
	17	景観	造成による地形変化、構造物による調和の阻害	不明	貯留施設の計画構想あり。
公害	18	大気汚染	車両や工場からの排出ガス、有害ガスによる汚染	無	発生の要因なし。
	19	水質汚濁	土砂の流入や水量の減少による水質の汚濁	不明	現況が不明。
	20	土壌汚染	排水・有害物質等の流出・拡散等による汚染	無	発生の要因なし。
	21	騒音・振動	車両の走行、ポンプの稼働等による騒音・振動の発生	無	発生の要因なし。
	22	地盤沈下	地盤変状や地下水位低下に伴う地表面の沈下	無	発生の要因なし。
	23	悪臭	排気ガス・悪臭物質の発生	無	発生の要因なし。
総合評価 ： ＩＥＥあるいはＥＩＡの実施が必要となる開発プロジェクトか				要	影響が想定される項目が有る。

表5-4　スコーピングチェックリスト　「河川・砂防」

環境項目			評定	根拠
社会環境	1	住民移転	A	施設建設の用地取得を要する。
	2	経済活動	D	
	3	交通・生活施設	D	発生の要因なし。
	4	地域分断	C	施設建設の用地取得を要する。
	5	遺跡・文化財	C	遺跡・文化財等に関して不明。
	6	水利権・入会権	C	水利権の有無が不明。
	7	保健衛生	D	発生の要因なし。
	8	廃棄物	C	建設廃材・残土等の発生。
	9	災害（リスク）	D	発生の要因なし。
自然環境	10	地形・地質	C	治水計画との関連により可能性あり。
	11	土壌浸食	D	発生の要因なし。
	12	地下水	C	涵養能力の低下及び水質（塩水化）の可能性あり。
	13	湖沼・河川流況	B	河川流況・河状の変化。
	14	海岸・海域	C	計画構想との関連により可能性あり。
	15	動植物	C	計画構想との関連により可能性あり。
	16	気象	D	気象に影響を与えるような大規模な建設構想はない。
	17	景観	C	計画構想との関連により可能性あり。
公害	18	大気汚染	D	発生の要因なし。
	19	水質汚濁	C	計画構想との関連により可能性あり。
	20	土壌汚染	D	発生の要因なし。
	21	騒音・振動	D	発生の要因なし。
	22	地盤沈下	D	発生の要因なし。
	23	悪臭	D	発生の要因なし。

注）1．評定の区分

A：重大なインパクトが見込まれる。

B：多少のインパクトが見込まれる。

C：不明（検討をする必要はあり，調査が進むにつれて明らかにある場合も十分に考慮に入れておくものとする）

D：ほとんどインパクトは考えられないためＩＥＥあるいはＥＩＡの対象としない。

2．評定に当たっては，該当する項目別解説書を参照し、判断の参考とすること。

表5-5　総合評価のフォーマット　「河川・砂防」

環境項目	評定	今後の調査方針	備考
住民移転	A	・政府の移転実施体制、移転代替案	ﾛｰｶﾙｺﾝｻﾙﾀﾝﾄの活用
湖沼・河川流況	B	・水利用現況	
地域分断	C	・施設建設による地域分断の状況と緩和策	ﾛｰｶﾙｺﾝｻﾙﾀﾝﾄの活用
遺跡・文化財	C	・遺跡・文化財の位置の確認	ﾛｰｶﾙｺﾝｻﾙﾀﾝﾄの活用
水利権・入会権	C	・水利用現況、土地所有形態現況	ﾛｰｶﾙｺﾝｻﾙﾀﾝﾄの活用
廃棄物	C	・発生残土量、土捨場確保の可能性	
地形・地質	C	・保存対象の地形・地質現況	
地下水	C	・地下水の利用状況	
海岸・海域	C	・河口付近の海岸現況、現況流送土砂状況	
動植物	C	・貴重種の生息域の確認	
景観	C	・貯留施設建設予定地の景観現況	
水質汚濁	C	・水質現況	

注）　評定の区分

A：重大なインパクトが見込まれる。

B：多少のインパクトが見込まれる。

C：不明（検討をする必要はあり、調査が進むにつれて明らかになる場合も十分に考慮に入れておくものとする）

D：ほとんどインパクトは考えられないためIEEあるいはEIAの対象としない。

第６章　本格調査の実施方針

6-1　調査背景

インドネシア国は、近年東部開発を政策課題として掲げ、住民内国移住を含む農地開発等重点的に開発を進め始めている。

アンボン島は、ジャカルタの東北東約2,200kmに位置し、今回調査の対象地域の一つである同島の中心地アンボン市は、マルク州の州都であり、同州の政治・経済の中心としてのみならずインドネシア東部開発の拠点として発展しているが、アンボン湾に面した同市は、三方を山に囲まれた４km²程の平地にあり、人口の稠密な市街地を形成している。

市街地には、バトゥガントン、バトゥガジャ、トモおよびバトゥメラの４つの河川が、また郊外にはルフの１河川が流下し、これらの流域面積の合計は約40km²である。上記５河川がいずれも源流から河口にかけて急峻な地形を有していることなどから、アンボン市は洪水の常襲地帯となっており、集中豪雨のたびに深刻な被害を受けている。特に1989年の大洪水には、河川沿いの民家が屋根まで浸水する大災害となった。アンボン市では公共事業省住宅総局による都市再開発計画が策定済みであるが、治水対策については今のところ策定されておらず、東部インドネシア開発の拠点における都市基盤整備の一環としてアンボン市の総合的な洪水対策計画の策定が急務となっている。

また、調査対象地域の他の一つであるアンボン島に隣接したセラム島パサハリ地区は、上記インドネシア国の東部開発政策に沿って、水田を中心とした農地開発が進められ人口稠密なジャワ島からの内国移住が開始されているが、同地区を流れるコビ川、サマール川に関しては洪水対策はいまだに策定されておらず、頻繁に洪水被害に見舞われている。かかる状況の下、同地区においては、居住地区がまだ河川に近接した箇所まで占められておらず、簡便であれ洪水対策計画を開発が完了する前に策定すれば、低額の投資額で、多大の効果が期待できる。

本件実施調査は、以上のような背景のもと、インドネシア国政府の要請に基づき、ＪＩＣＡが派遣した事前調査団とインドネシア国公共事業省水資源総局との間で平成８年４月18日に署名交換したＳ／Ｗに基づいて実施するものである。

6-2　調査基本方針

（１）　アンボン市

１）基本的には公共事業省マルク州建設局で作成した「アンボン市治水計画」を極力活用するものとする。また、円滑な調査の実施および技術移転の面から、右調査を実

施したローカルコンサルタントのスタッフを可能な範囲で本調査に参加させることが望ましい。

2）洪水氾濫の水深が比較的浅く継続時間も短いこと、さらに氾濫区域内の資産も多くないことから、洪水対策のみを目的とした場合フィージブルにならない可能性がある。一方、劣悪な河川環境、深刻な水不足といった問題があり、これらの解決がアンボン市にとって洪水対策に劣らず重要かつ緊急な課題である。

従って、アンボン市の洪水対策は、単に洪水防御のみでなく極力河川環境の改善や水資源開発にも資するよう計画するものとする。

3）洪水対策としては、①ダム建設②河道の三面張り複断面化③パラペットの嵩上が考えられる。各河川毎に最適な工法を選定するものとする。

ダム建設は、洪水対策として効果的であり、さらに上水供給や乾期の河川水量増による水質改善も期待できる。「アンボン市治水計画」の中ではバトゥメラ川、トモ川、バトゥガジャ川、の各河川で1基づつ提案されているが、ルフ川、バトゥガントン川、についても可能性を調査する。

河道の三面張り複断面化は、河積の拡大と粗度係数の減少により洪水疎通能力の向上を図ることができ、さらに、平水時における低水路の流速は単断面の場合より大きくなるので、流水の澱みが少なく環境改善に資することが期待できる。また、ダムを建設した場合河床が低下してパラペットが不安定になる可能性があるので、ダム建設と三面張り複断面化の組み合わせも検討する。なお、この工法は河川による地下水涵養量を減少させるので、地下水位の低下が問題となる場合には、工法や材料に工夫が必要である。

パラペットの嵩上げは、多数存在する橋梁の嵩上げが不可能に近いので望ましい案ではない。

4）洪水対策の一環として、パラペット開口部（家庭排水、道路側溝排水用）の閉鎖が必要である。個別に閉鎖する方法と統合してゲートを設置する方法があるが、いずれにしても、降雨から洪水流出までの時間が非常に短いので、複雑な操作を必要とする施設は適当でない。

5）水源地域の開発（大規模宅地開発等）が進行しつつある。水源地域の開発は洪水（ピーク流量）および土砂流出の増大につながるので、洪水対策の面からも、なんら

かの規制を行い水源地域を良好に保全することが必要である。

従って、源地域の保全についても検討し必要な措置について勧告するものとする。例えば、開発の規制、開発の影響を相殺するような措置（大規模開発には調節池の建設を義務づけるなど）が考えられる。

6）防災や河川環境の改善は、行政と市民が一体となって行うものであり、市民の理解と積極的参加が不可欠である。このため、治水施設の維持管理および河川の環境改善に関する行政サイドの役割と体制について提案するとともに、市民への啓蒙や必要ならば市民団体の組織化等についても検討し提案するものとする。

（2） パサハリ地区

1）サマル川右岸尾およびコビ川右岸の灌漑区域を対象として、概念的な洪水対策計画（コンセプチュアルプラン）を策定する。精度についてはアンボン地区において策定するM／Pレベルのものを要求するものではないものとする。

2）将来、他の地域で新たに灌漑事業を計画する際、治水上考慮すべき事項についても提案する。（例えば、家屋は比較的高地に建てるかまたは基礎を高くする、堤防は道路や水路との兼用工作物として計画するなど。）

6-3 調査目的

アンボン市域における洪水対策に関し、地域開発、利水等も考慮にいれた総合的なマスタープランを策定する。また、セラム島パサハリ地区を対象にした概念的な洪水対策計画（コンセプチュアルプラン）を策定する。さらにアンボン市に対しては、優先プロジェクトにかかるフィージビリティー調査を実施することを目的とする。

6-4 調査対象地域

（1） アンボン島アンボン地区を流れる5河川

1）バトゥガントン川

2）バトゥガジャ川

3）トモ川

4）バトゥメラ川

5）ルフ川

（2） セラム島パサハリ地区を流れる2河川

1）コビ川

2）サマール川

6-5 調査項目および内容

フェーズⅠ：洪水対策に関するマスタープランの策定

（1） 既存資料・情報の収集・整理

（地勢、気象、水文、河川・流域、既存河川施設、洪水被害・痕跡、洪水予報システムの実態調査、河川管理関係法体系・規制・政策・組織、水利用実態、土地利用現況、環境政策、国家経済・地域経済、地域開発計画・政策等）

（2） 現地踏査

（地形・地質河川及び河川流域現況、河川施設現況、洪水氾濫・被害調査、洪水被害、洪水予警報システムの実態調査、水利用実態、社会経済／土地利用、環境・衛生等）

（3） 実査

（気象・水文観測、水質調査、土砂調査、河川縦横断測量等）

（4） 解析・検討

（基礎調査（1）（2）（3）の結果の解析、水文流出解析、氾濫解析、洪水被害解析、土砂流出解析）

（5） 洪水対策マスタープランの策定

（施設計画、非構造物対策、事業費概算等）

（6） 初期環境調査（ＩＥＥ）

（7） 優先プロジェクトの選定等

（8） コンセプチュアルプランの策定

フェーズⅡ：優先プロジェクトのフィージビリティー調査

（1） 現地補足調査

（2） 平面測量

（3） 地質・土質調査

（4） 環境影響評価

（5） 計画諸元の検討

（6） 施設計画

（7） 施設概略設計

（8） 施工計画

（9） 管理運営計画

（10） 事業費概算

(11)　事業評価

(12)　実施計画

6-6　調査行程

本格調査の期間よおび工程は、S／Wに示したスケジュールに従い、全体で15カ月とする。

6-7　要員計画

本件調査は、以下の担当分野を含むものとする。

（1）　総括

（2）　治水計画

（3）　気象／水文・水理

（4）　洪水解析／被害調査

（5）　地形・地質

（6）　施設計画

（7）　施工計画／積算

（8）　社会経済／土地利用

（9）　環境

(10)　河川測量

(11)　業務調整

6-8　調査実施体制

調査実施体制については、図6-1のとおりである。

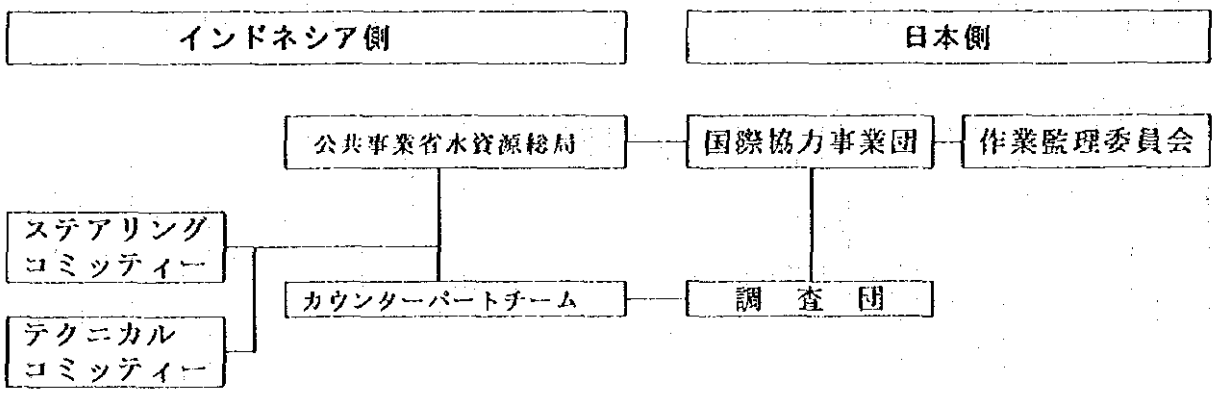


図6-1　調査実施体制

6-9 調査実施に関する留意点

（1） 本調査に必要とされる気象および水文関係のデータが十分に得られない場合も想定され、計画策定に必要な流出解析、氾濫解析等のシミュレーションは限られたデータを用いて実施することになる。今後の計画策定の精度を向上させるためにも、気象、水文観測のあり方について提言することが望ましい。

（2） アンボン地区の河川の中下流部は家屋が河川沿いに密集し、河川の排水路化、ごみの投棄場所等となっており、河川環境として劣悪な状況にある。その一方で、河道内に設けられた浅井戸の水を生活用水として利用したり、河川水を洗濯、水浴等に沿川の住民は日常的に利用していることから、生活衛生環境として良好な環境にあるとは言えない状況である。アンボン地区の洪水対策の計画策定に際しては、対象河川の自然的・社会的環境を踏まえた都市河川環境の改善に係る方策について提言を行う必要があろう。

（3） インドネシア国における環境影響評価制度により、Ｆ／Ｓ対象のプロジェクトがＡＮＤＡＬ調査を実施するプロジェクトに該当するかどうか、また、同調査を必要とした場合のＴＯＲの承認手続き等をＦ／Ｓ開始前に行っておく必要がある。特に、同国における過去の実施例からみて、一般に審査に要する時間が長くなることが通例であると言われている。このため、ＡＮＤＡＬに係る諸手続きをＦ／Ｓにおける現地調査が開始されるまでに完了しておくことが必要である。本承認手続きが予定どおりに完了されていない場合、Ｆ／Ｓの全体工程に支障が生じるため、前もって公共事業省と十分にＡＮＤＡＬ調査に関する事項について協議を行っておく必要がある。

付　属　資　料

1．インドネシア国政府要請書
2．SCOPE OF WORK（S／W）
3．MINUTES OF MEETING（M／M）
4．質問書及び回答
5．主要面会者リスト
6．資機材関係資料
7．ローカルコンサルタントのリスト
8．現地調査費経費資料
9．収集資料リスト

1．インドネシア国政府要請書

NO.8

Code Number : BTA - 228

1.	Project Title	:	STUDY FOR DEVELOPMENT OF AMBON AREA FLOOD CONTROL
2.	Location	:	Ambon, Maluku.
3.	Executing Agency	:	Directorate General of Water Resources Development, Ministry of Public Works
4.	Objectives	:	- To formulate a comprehensive plan for water resources development with the emphasis on flood control in Ambon city. - To carry out a feasibility study for urgent measures to protect Ambon city from habitual flooding. - To support industrial development in Ambon Island.
5.	Project Description	:	Ambon city suffers habitual damages from inundation due to the flood of the torrential rivers of the Batu Gantung, Batu Gajah, Tomu, Batu Merah, and Ruhu. Steep gradient and intensive rainfall cause serious damage. The increase in population and properties of Ambon city make the matter worse. Bank erosion of the rivers and drainage hazard in the urban and rural areas are also serious problems. In view of the importance of the area in regional as well as national economy, urgent flood control works within a framework of a comprehensive plan is proposed. This study consists mainly on comprehensive plan such as survey, investigation and topographic mapping which is part of Ambon Integrated Urban Infrastructure Development project.
6.	Scope of Assistance Requested		a. Expert services : 130 m.m = US $.1,300,000 b. Fellowships : 8 m.m = US $. 40,000 c. Equipment : = US $. 450,000 Total Cost = US$ .1,790,000
7.	Related to Project aid		

TERM OF REFERENCE

FEASIBILITY STUDY FOR DEVELOPMENT OF
AMBON AREA FLOOD CONTROL

I. BACKGROUND AND SUPPORTING INFORMATION

1.1. Justification of the Project

The rivers in the project area are the Batu Gunung, Batu Gajah, Tomu, Batu Merah and Ruhu rivers which originate in the south-eastern mountains of Ambon city. These rivers flow down almost to the north-west and pour into the Bay of Ambon.

The Batu Gantung and Batu Gajah rivers run the south of the Central Ambon, the Tomu and Batu Merah rivers flow to the central part and the Ruhu river runs to the north side. The total catchment area of the the five (5) rivers are some 40 sq.km.

Owing to the steep gradient and intensive rainfall in their upstream reaches of the rivers, Ambon city is subjected to inunddation by the flood of the torrential rivers.

In the recent years particularly in 1989, Ambon city has suffered from recurrent flood damage seemingly due to deterioratione of the existing flood control facilities and increase in population and properties of the area. The flood damage is not limited in the urban and semiurban areas of Ambon but also extended over the rural area along the coast. Potential damage by flooding has also been increasse especially in the new developed land. Bank erosion of the rivers and drainage hazard in the urban and rural are also serious problems to be solved.

In view of the above, it will be justifiable to formulate an urgent flood control plan for the project area.

1.2. Institutional Framework.

a. Domestic Provision.

Directorate General of Water Resources Development, Ministry of Public Works takes responsibility for the proposed feasibility study, and Public Works of Maluku Province will be the main body of undertaking the field survey and study.

Because of the complex nature of the project, coordination and cooperation between DGWRD and CIPTA KARYA will be needed.

A special executing body may have to be created to ensure an effective implementation of the works to be proposed.

III. OUTLINE OF THE STUDY

3.1. The Survey Area

The survey area for flood control is inundation area of the Batu Gantung, Batu Gajah, Tomu, Batu Merah and Ruhu rivers.

The survey area for the study of the development potential of water resources is covered by the basins of the Batu Gunung, Batu Gajah, Tomu, Batu Merah and Ruhu rivers.

3.2. Topographic Map

The existing topographic maps scaled 1 to 40,000 and 1 to 5,000 will be available for the execution of the formulation of comprehensive plan and feasibility study.

3.3. Scope of Work

The studies will be comprised of the following :

a. Review

- Review of the existing maps and other survey result relevant to the project.
- Review of the preceeding studies relevant to the project objectives.

b. Surveying

- Execution of cross sectional survey needed for the objectives of the study.
- Check on the elevation of the existing bench marks in the project area.

c. Collection of data and information relevant to

- Hydrollogy and meteorology
- Rural development
- Urbanization and industrial development
- Regional economy and sociology
- River and drainage improvements
- Others.

d. Hydrological Study
- Rainfall analysis for flood runoff
- Stream analysis for flood runoff
- Estimation of sediment ttransportation in rivers
- Sea tide fluctuation

e. Geological and soil mechanic ivestigations

- General geological survey of the river basins

- Investigation of foundation at conceivable dam sites
- Investigation of foundation layer of embankment and structures to be planned by means of machine boring and sounding test
- Sampling and laboratory test of soil for structure foundation and borrow area
- Sampling and sieve analysis of bed materials in river and sea

f. Formulation of comprehensive flood control plan

- Estimation of carrying capacity of the existing river channel
- Study on reservoir development plan
- Alternative study on flood control schames
- Preparation of the basic layout of reservoirs
- Preparation of the basic layout of river channel and related facilities
- Estimation of construction cost
- Survey of flood damages
- Economic evaluation

g. Formulation of urgent flood control plan

- Determination of design discharge
- Deetermination of river stretches to be improved and reservoirs to be constructed for purposed urgent flood control plan
- Preparation of basic design of dams and rreservoirs
- Preparation of the basic design of river channel and related facilities
- Estimation of quantities for construction works

h. Constructon planning and cost estimate for urgent flood control plan

- Study on construction equipment to be available at the site, construction materials and their cost estimates
- Study on construction method and construction schedule

i. Economic evaluation for urgent flood control plan

- Estimation of economic prices concerning the construction costs and benefits
- Study on cost-benefit analysis
- Preparation of fund disbursement schedule
- Study on project effect and social impact

3.4. Transfer of Knowledge

The transfer of knowledge and training of government staff shall be conducted throughout the study period as follows :

- Transfer of knowledge in carrying out of necessary surveys

and investigations through the on job training, and Training in an overseas country for selected government staff to obtain wider knowledge and perspective on modern practices and techniqeus related to the study.

IV. TIME SCHEDULE AND REQUIRED EXPERRTS

4.1. Time schedule

The time schedule is shown in the ANNEX -1.

4.2. Required experts

To carry out the study, the experts for the following specialities will be required.

a. Project management
b. Topographic survey
c. Hydrology
d. Geology
e. Soil-mechanic
f. Hydraulics
g. River engineering
h. Urban drainage engineering
i. Structural design
j. Dam construction engineering
k. Construction planning
l. Project economy

V. REPORTS

The following reports will be prepared.

1. Inception report (copies)
   Within one (1) month after commencement of the study

2. Progress report (copies)
   Within nine (9) months after commencement of the study

3. Interim report (copies)
   Within sixteen (16) months after commencement of the study

4. Draft Final Report (copies)
   Within nineteen (19) months after commencement of the study

5. Finall Report (copies)
   Within twenty-one (21) months after commencement of the study

VI. UNDERTAKKING OF THE GOVERNMENT OF INDONESIA

To faacilitate the smooth implementation of the study, the

b. External Assistance Needed

In view of possible difficulties in dealing with complex problems inherent to the area of the alluvial formation, external assistance in formulating and implemanting the project will be needed. The Goverment of Japan, which has many of similar problems and had experienced in solving them, will be invited to offer its assistance in this connection.

1.3. Preceeding Studies.

The following references are available for the study.

1. Daftar inventarisasi Sungai-sungai di Propinsi Maluku.
2. Rencana Pengembangan Jaringan Transportasi terpadu di Propinsi Maluku (ringkasan)
3. Rencana Tata Guna Hutan di Propinsi Maluku (ringkasan)
4. Laporan hasil Penyelidikan Hidrolis dengan model "Rencana Bendung Tele".
5. Laporan Hasil Penyelidikan Hidrolis dengan Model Pemindahan alur Sungai Sikulah.
6. Studi Kelayakan Teknis Pengembangan Irigasi di Wilayah Dataran Pasahari (P. Seram - Maluku).
7. Darinage Kota Madya Ambon.
8. Studi Identifikasi Potensi Pengembangan Sumber-sumber Air di Wilayah Maluku.
9. Rencana Pengembanngan Daerah Irigasi P. Buru Propinsi Maluku dan Tinjauan Singkat tentang irigasi di Pasahari (P. Seram) dan D.I. Kao (P. Halmahera).

II. OBJECTIVE THE STUDY

The objective of the study is :

1. To formulate a comprehensive plan of water resources development in emphasis on flood control in Ambon city, and

2. To carry out a feasibility study for urgent measures to protect Ambon city from habitual floodings.

Government of Indonesia shall take necessary measures.

1. DGWRD shall make necessary arrangement with the cooperati on of other rellevant organizations for the following :

   a. to secure the safety of the study team,
   b. to permit the members of the study team to enter, leave and sejourn in Indonesia for duration of their assign - ment therein, and exempt them from alien regristration requirements (and consular fees)
   c. to exempt the members of the study team from taxes, duties and other charges of equipment, machinery and other materials brought into Indonesia for the implementation of the study,
   d. to exempt the members of the study team from income tax and other charges imposed on or in connection with any emolument or allowance paid to the members of the study. team for their services in connection with the implementation of the study,
   e. to provide medical services as needed. its expenses will be chargeable on the members of the study team,
   f. to secure permission to takke all data and documents (including photographs) related to the study out of Indonesia to foreign country by the study team.

2. DGWRD shall, at its own expenses, provide the study team with the following, in cooperation with other relevant organizations :

   a. available data annd information related to the study
   b. counterpart personnel
   c. suitable office space with necessary equipment in Jakar ta
   d. credentials or identification cards.

3. The Government of Indonesia shall bear claims, if any ari ses againts the members of the study team arising from, occuring in the course of, or otherwise connected with the discharge of their duties in the immplementation of the study, except when such claims arisefrom gross negligence or wilful misconduct on the part of the members of the study team.

4. DGWRD will asist for the study team to arrange accomoda - tion.

5. The Government of Indonesia shall provide necessary vehi - cle for the implementation of the study.

6. DGWRD will conduct the following survey under the supervi- sion of experts of the study team.
   - survey such as plane, cross section and longitudinal profile covering majoe stretch of river channel, and

prooposed major drainage channel (Overall Plan and Feasibility Studies)

- topographic survey for proposed structure sites (Feasibility study)
- geological survey team such as test drilling works for major facilities sites including construction material survey (Feasibility Study).

VII. EQUIPMENT REQUIRED FOR THE STUDY

The equipment required for the study is listed in the ANNEX -2, by external assistance.

EQUIPMENT REQUIRED

1. Three.long chasis land cruisers equipped with VHF communication equipment, air conditioner, roof carrier and trailer hook.
2. One glass fiber boat equipment with an outboard motor and a set of echo sounder and its recorder.
3. One trailer for transporting the boat above.
4. One set of geo-electric propecting equipment.
5. Two electronic distance metres
6. Two sets of current meter, direct reading type.
7. One unit of sea bottom material sampler
8. One unit of electric conductivitymeter
9. One unit of basic soil-mechanic test equipment
10. One set of standard sieves.
11. One table computer
12. One photocopy machine
13. Two voltages stabilizers, 50 KW, 220 volt
14. One data processor with type-writer.

2. SCOPE OF WORK (S/W)

THE SCOPE OF WORK

FOR

THE STUDY

ON

FLOOD CONTROL

FOR

AMBON AND PASAHARI AREA

IN

THE REPUBLIC OF INDONESIA

AGREED UPON BETWEEN

MINISTRY OF PUBLIC WORKS

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

JAKARTA, APRIL 18, 1996

Mr. Krenius MARPAUNG
DIRECTOR FOR PLANNING AND PROGRAMMING,
DIRECTORATE GENERAL OF WATER RESOURCE DEVELOPMENT,
MINISTRY OF PUBLIC WORKS

Mr. Kazuo NAKAGAWA
LEADER,
PREPARATORY STUDY TEAM,
JAPAN INTERNATIONAL COOPERATION AGENCY

I. INTRODUCTION

In response to the request of the Government of the Republic of Indonesia (hereinafter referred to as "the Government of Indonesia"), the Government of Japan has decided to conduct the Study on Flood Control for Ambon and Pasahari Area (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

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

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 a master plan for comprehensive flood control for Ambon central area,
2. to conduct a feasibility study on the urgent and/or priority project(s),
3. to formulate a conceptual/schematic plan for flood control for Pasahari area in Seram Island and,
4. to carry out technology transfer to the counterpart personnel of the Government of Indonesia in the course of the Study.

III. STUDY AREA

The Study area shall cover the basins of following rivers.

<Ambon central area>

-1 Batu Gantung River
-2 Batu Gajah River
-3 Tomo River
-4 Batu Merah River
-5 Ruhu River

<Pasahari area>

-1 Samal River
-2 Kobi River

IV. SCOPE OF THE STUDY

In order to achieve the above objectives, the Study will cover the following items:

Phase I : Formulation of the master plan for comprehensive flood control

(1)Collection and review of existing data and information

- (a) Topography
- (b) Meteorology and hydrology including sea water tides
- (c) River and river basin
- (d) Existing facilities and measures related to flood control and drainage (eg. bridges, revetments, checkdams, drainage systems etc.)
- (e) Flood mark and flood damage
- (f) Existing flood forecasting and warning system
- (g) Laws, regulations, policy and institution related to the river management
- (h) Water use
- (i) Land use and vegetation
- (j) Environmental policy
- (k) National and regional socio-economy
- (l) Regional development plans and policies
- (m) Others

(2)Field reconnaissance

- (a) Topography
- (b) River and river basin
- (c) Existing facilities and measures related to flood control and drainage
- (d) Flood mark and flood damage
- (e) Existing flood forecasting and warning system
- (f) Water use
- (g) Land use
- (h) Environment
- (i) Socio-economic situation

(3)Field survey (if necessary)

- (a) Meteorology and hydrology
- (b) Geology and soil
- (c) Water quality
- (d) Sediment discharge
- (e) Profile and cross-section of the rivers
- (f) Topography

(4)Study and Analysis

(a) Hydrological analysis
(b) Run-off analysis
(c) Clarification of flood mechanism
(d) Flood damage (flooded area and damage cost)
(e) Water balance analysis
(f) Sediment discharge
(g) Regional development tendency for the future (regarding socio-economy, water use, land use etc.)

(5)Formulation of master plan

(a) Structural measures
(b) Non-structural measures
(c) Cost estimation

(6)Initial Environmental Examination (IEE)

(7)Evaluation

(a) Economic and financial evaluation
(b) Social impact evaluation

(8)Selection of priority project(s)

(9)Formulation of conceptual plan for Pasahari area

Phase II : Feasibility study on the urgent and/or priority project(s)

(1)Supplemental data collection and field survey
(2)Preliminary design of facility(ies)
(3)Construction plan
(4)Operation and maintenance plan
(5)Cost estimation
(6)Evaluation

(a) Environment Impact assessment (EIA)
(b) Social impact evaluation including land acquisition and resettlement
(c) Economic and financial evaluation

(7)Implementation plan

V. SCHEDULE OF THE STUDY

The tentative schedule of the Study is shown in Annex attached.

VI. REPORTS

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

1. Inception Report:
   Twenty(20) copies at the beginning of the work in Indonesia.

2. Progress Report (1):
   Twenty(20) copies at the end of the first work period in Indonesia.

3. Interim Report:
   Twenty(20) copies at the beginning of the second work period in Indonesia.

4. Progress Report (2):
   Twenty(20) copies at the end of second work period in Indonesia.

5. Draft Final Report:
   Twenty(20) copies within fourteen(14) months after the commencement of the Study.
   The Government of Indonesia will present its comments to JICA within one(1) month after the receipt of the Draft Final Report.

6. Final Report:
   Fifty(50) copies within one(1) month after JICA's receipt of the said comments on the Draft Final Report.

VII. UNDERTAKINGS OF THE GOVERNMENT OF INDONESIA

1. To facilitate smooth implementation of the Study, the Government of Indonesia shall take necessary measures:

   (1) to secure the safety of the Japanese Study Team,

   (2) to permit the members of the Study Team to enter, leave and sojourn in Indonesia for the duration of their assignment therein, and to exempt them from foreign registration requirements and consular fees,

   (3) to exempt the members of the Study Team from taxes, duties and any other charges on equipment, machinery and other materials brought into and out of Indonesia for the implementation of the Study,

   (4) to exempt the members of the Study Team from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Study Team for their services in connection with the implementation of the Study,

   (5) to provide necessary facilities to the Study Team for remittance as well as utilization of funds introduced into Indonesia from Japan in connection with the implementation of the Study,

   (6) to secure permission for entry into private properties or restricted areas for the implementation of the Study,

   (7) to secure permission for the Study Team to take all data and documents (including photographs and maps) related to the Study out of Indonesia to Japan, and

   (8) to provide medical services as needed. Its expenses will be chargeable on the members of the Study Team.

2. The Government of Indonesia shall bear claims, if any arises, against the members of the Study Team resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Study Team.

3. The Directorate General of Water Resources Development, Ministry of Public Works (hereinafter referred to as "DGWRD") shall act as a counterpart agency to the Study Team and PWRS of DINAS Public Works in Maluku Province shall also act as a coordinating body in relation with other governmental and non-

governmental organizations concerned for the smooth implementation of the Study.

4. DGWRD shall, at its own expense, provide the Study Team with the followings, in cooperation with other organizations concerned:

   (1) available data (including photographs and maps) and information related to the Study,

   (2) counterpart personnel,

   (3) suitable office space with necessary equipment and furniture in Ambon, and

   (4) credentials or identification cards.

VIII. UNDERTAKINGS OF JICA

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

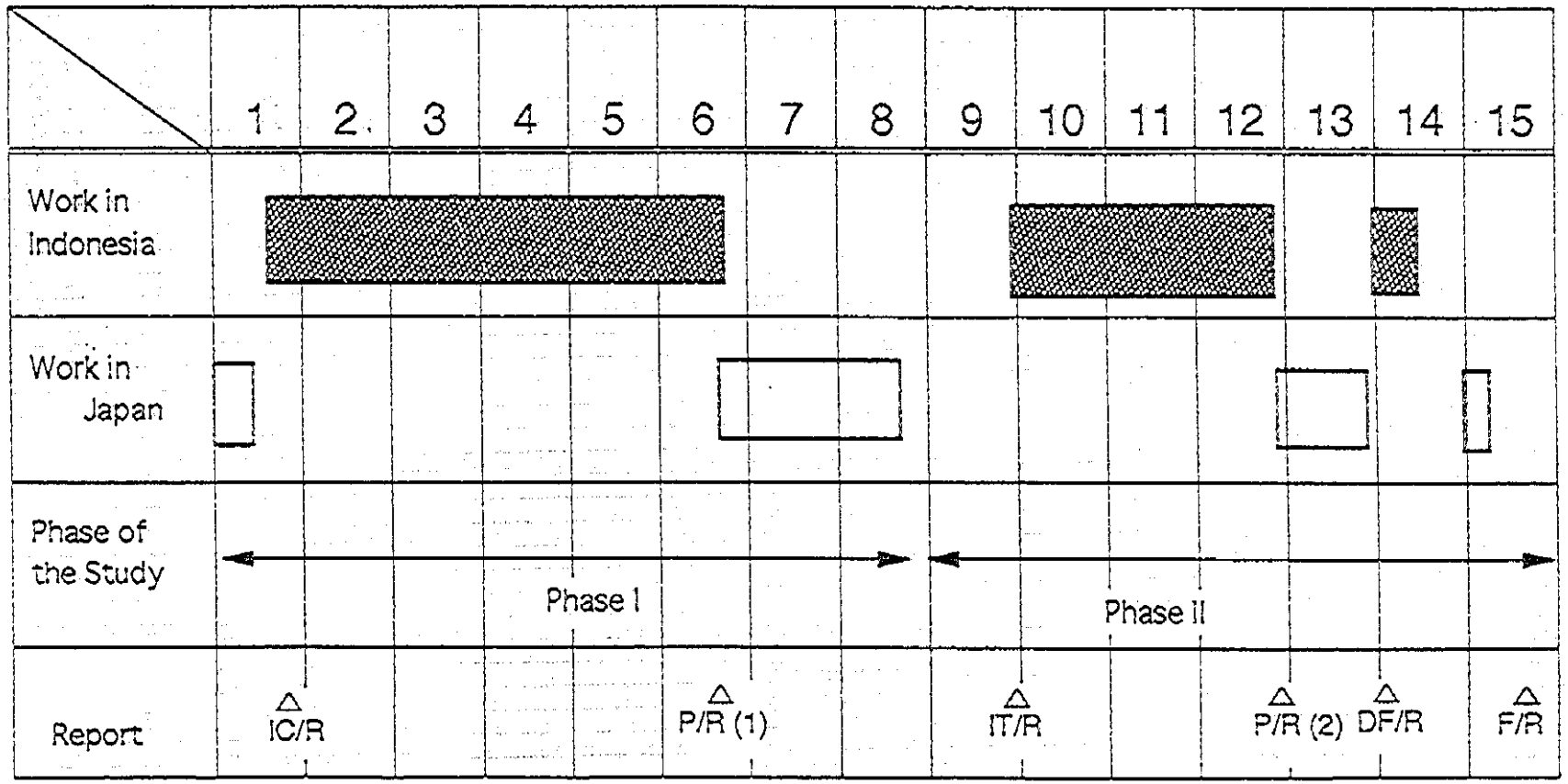
1. to dispatch, at its own expense, the Study Team to Indonesia, and
2. to pursue technology transfer to the Indonesia counterpart personnel in the course of the Study.

IX. CONSULTATION

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

ANNEX

TENTATIVE SCHEDULE



IC/R : Inception Report
P/R : Progress Report
IT/R : Interim Report
DF/R : Draft Final Report
F/R : Final Report

3. MINUTES OF MEETING (M/M)

MINUTES OF MEETINGS

FOR

THE STUDY

ON

FLOOD CONTROL

FOR

AMBON AND PASAHARI AREA

IN

THE REPUBLIC OF INDONESIA

AGREED UPON BETWEEN

MINISTRY OF PUBLIC WORKS

AND

JAPAN INTERNATIONAL COOPERATION AGENCY

JAKARTA, APRIL 18 ,1996

Mr. Krenius MARPAUNG	Mr. Kazuo NAKAGAWA
DIRECTOR FOR PLANNING AND PROGRAMMING,	LEADER,
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT	PREPARATORY STUDY TEAM,
MINISTRY OF PUBLIC WORKS	JAPAN INTERNATIONAL COOPERATION AGENCY

In response to the request of the Government of the Republic of Indonesia, (hereinafter referred to as "the Government of Indonesia") the Government of Japan has decided to conduct the Study on Flood Control for Ambon and Pasahari (hereinafter referred to as "the Study") through Japan International Cooperation Agency (hereinafter referred to as "JICA").

The JICA preparatory study team(hereinafter referred to as "the Study Team"), headed by Mr. Kazuo NAKAGAWA, visited the Republic of Indonesia from April 7, 1996 to April 20, 1996, where field survey of the study area was carried out and a series of meetings were held with Directorate General of Water Resources Development, Ministry of Public Works (hereinafter referred to as "DGWRD") and other authorities concerned of the Government of Indonesia. The list of attendants is shown in Annex 1.

The draft S/W proposed by the Study Team was discussed in detail between DGWRD and the Study Team and Both sides agreed to adopt the S/W with the following understandings.

I. OBJECTIVES OF THE STUDY

As is mentioned in S/W, main objective of the study is to formulate the master plan for flood control for Ambon central area and to carry out feasibility study on the urgent and/or priority project(s), additionally to formulate conceptual plan for flood control for Pasahari area in accordance with strong request by the Indonesian side.

And, in the Phase I of the study, master plan study which will be made possible for water supply by utilizing flood control facilities shall be carried out. And in the Phase II of the study, feasibility study on priority project(s) will be conducted.

II. SCOPE OF THE STUDY

1. STUDY AREA
Both sides agreed that river basins of Samal and Kobi rivers in Pasahari in Seram Island shall be included in study area for the urgent planning for flood control before further development shall be proceeded. The Study Team agreed to include Seram area to The Study area in the S/W.

2. Water resource development
DGWRD requested the study team to conduct study and analysis on water resources development in the master plan study. The Study Team explained that the Study shall be originally focused on flood control and that it will be a secondary product from the Study result regarding flood control. DGWRD agreed to it and to record it in M/M.

3. Level of conceptual plan for Pasahari area
   The Study Team explained the level of conceptual plan for Pasahari area shall be less in detail than master plan and just conceptual one. This is in view with the limited available data and information in this area and because irrigation program has already commenced by the Indonesian Government. Submission of conceptual plan by JICA shall be sufficient for implementation of flood control by the Indonesian side itself.

4. Operation and maintenance
   DGWRD requested the Study Team to conduct study on institutional set-up as a part of study on operation and maintenance plan for river management in the feasibility study. The Study Team explained that it was already included in the scope of the study, and agreed to record the request to make sure.

III. REPORTS

1. As for the Final Report, DGWRD agreed to be open to the public in order to approach to various supporting agencies.

IV. UNDERTAKINGS OF THE GOVERNMENT OF INDONESIA

1. The Study Team requested DGWRD to assign necessary counterpart personnel with specialities mentioned in S/W and supporting staff for the smooth implementation of the Study and DGWRD accepted the request.
2. The Study Team confirmed that DGWRD will prepare suitable office space in Ambon and that DGWRD shall offer such suitable space as meeting room in Jakarta.
3. DGWRD requested the Study Team that taking out of Indonesia some photographs and maps related to the Study shall follow Indonesia regulations.

V. UNDERTAKINGS OF JICA

1. DGWRD requested the Study Team to carry out counterpart training in Japan and the Study Team agreed to convey the request to JICA H.Q. for the necessary arrangement for the training.
2. DGWRD requested the Study Team to hold a seminar as a part of technology transfer mentioned in S/W and the Study Team agreed to convey the request to JICA H.Q. for the positive consideration.

VI. STUDY EQUIPMENT

- DGWRD requested the Study Team to provide with equipment for the Study listed in Annex 2. The Study Team promised to convey the request to JICA H.Q. for its considerations and decisions.

VII. STEERING COMMITTEE

- Both sides agreed to establish a steering committee for more effective and more efficient implementation of the Study. The committee shall be comprised of the representatives of DGWRD, and those other ministries, agencies and organizations concerned and will be coordinated by DGWRD.
- Both sides agreed to establish a technical committee for more technical and more substantial matters regarding the Study, which shall be comprised of agencies and organizations concerns in Province of Maluku and shall be coordinated by Bappeda TK I, MALUKU.

Annex 1

List of Attendants

[Indonesian Side]

NAME	POSITION
<DGWRD>	
Ir. Krenius MARPAUNG	Director of planning and programming
Ir. M. Yusuf GAYO	Director of construction guidance of east region
Ir. Hafied A. GANY	Director of utilization and conservation of water resources
Ir. M. HASAN	Sub Director of general planning, BIP
Ir. Adi SARWOKO	Sub Director of region III, Director of construction guidance of east region
Ir. Rustam SYARIF	Sub-dir. of development conservation of water resources Dit. of utilization and conservation of water resources
Drs. Herwiryanto	Head, Sub-dit. of foreign aid and administration
Ir. Ruchyat KUSTOMI	Directorate of planning and programming
Mr. N. Ginting	Dit. of construction guidance of east region
Dr. Sutardi	Dit. of planning and programming
Mr. Guitom	Dit. of planning and programming
Mr. Kiyofumi YOSHINO	JICA expert on water resources development
<Ambon>	
Mr. Johanes SUDIJONO	Mayor of Ambon city
Dr. Ir. Ms Latuconsina	Head of Bappeda TK I
Ir. Handrajadi	Head of Kenwil PU, Maluku
Ir. Tedjo POERNOMO	Head of Dinas PU, Maluku
Ir. Pieter MUSTAMU	Head of Sub Dinas Engineering Maluku
Ir. Satoto Basuki BE	Project Manager

[Japanese Side]

<Study Team>	
Mr. Kazuo NAKAGAWA	Team Leader
Mr. Nobuaki MIYATA	Project Officer
Mr. Hidetomi OI	Flood Control Planning
Mr. Shigeru YAMAMOTO	Watershed Management
Mr. Nobuyuki OKABE	Hydrology / Hydraulics
Mr. Masanobu SAKAMOTO	River Facilities

ANNEX-2

STUDY EQUIPMENT REQUESTED BY DGWRD

No.	Item	Q'ty
1.	Long chassis four wheels drive vehicle with VHF communication tools, A/C, roof carrier and trailer hook	5
2.	Geo-electric prospecting equipment	1 set
3.	Electronic distance meter	2
4.	Current meter of direct reading type	3 sets
5.	Sea bottom material sampler	1
6.	Electric conductivity meter	1
7.	Basic soil-mechanic test equipment	1
8.	Standard sieves	1 set
9.	Table computer	3 sets
10.	Photocopy machine	1
11.	Voltage stabilizer, 50kw 220V	2
12.	Data processor with type-writer	1
13.	Topographic surveu equipment	1 set
14.	Facsimile machine	1

4．質問書及び回答

I. Questionnaire

1. General

(1) Background of request for the Study on the Flood Control for Ambon City (hereinafter referred to as the Study).

(2) Is the proposed scope of work for the Study acceptable or not ?

(3) What agency is the counterpart to JICA Study ?

(4) What is the relevant organization/agencies for the Study ?

2. Flood Control

(1) What is the major reason of flooding in the Study area?

- River overbanking
- Deteriorated dike or poor maintenance of dike
- Poor drainage system
- Sediment deposition
- Change of land use
- Increase of settlement area
- Devastation of the catchment area

(2) How is the following condition in the Study area ?

- Statistical records of damage and loss caused by flooding and heavy rainfall
- Frequency of flooding, annually, once in 2 years or 5 years
- Inundation area, inundation depth, occurrence date, duration and hyetograph (hourly rainfall) during the major floods in the Study area
- Probable rainfall that could start to cause flood damage
- Habitual inundation area

(3) Difficulty of land acquisition

- Problem on land acquisition (compensation, reaction of resident, cultural inheritance, social background)
- Difficult area for the land acquisition (residential, industrial, commercial, paddy field, plantation, etc.)

(4) How is the flood protection level for the master planning decided by the DGWRD ?

Are standards and guidelines for deciding flood protection level established ? If available, are they taking into account the following ?

- Urban area and rural area

- Degree of importance of river
- Primary drainage, secondary drainage and tertiary drainage

(5) Where is an area with the first priority in the Study area to prevent flooding ?

(6) What is the assets to be protected by the project in the Study area?

- Urban area
- Paddy fields, plantations, agricultural and residential areas

(7) Is the future land use and development plan in the Study area established ?

(8) Is the situation of the relevant existing and/or on-going flood mitigation and drainage plan in the Study area.

(9) Does the proposed dam projects for flood control in the Study area have a high viability from technical, environmental and economic aspects ?

3. River Basin Management

(1) Is the following management works for mitigating flood damage applied ?

- Zoning of flood prone area with ranks in consideration of frequency and flood damage
- Setting forth of regulation for land use in the designated flood prone area
- Structural change to the existing houses for flood proofing in the habitual inundation area
- Restriction of new house buildings in the designated flood prone area
- Establishment of flood forecasting and warning system
- Land conservation and reforestation in the river basins

(2) Is there any organization for flood fighting in the Study area ? If organized, what is the tasks of Ministry of Public Works, the local government of Maluku Province, and Ambon City, and inhabitants ?

4. Water Resources Development

(1) Current situation on water demand and supply balance in water sectors ?

(2) Is the future overall water utilization and development plans in the Study area established ? what's the targets of the plan in case that the plan is available ?

- Target year of water resources development
- Future water demand in the related water sectors
- Water resources development program
- Objectives to review on the water resources development projects in the Study ?

(3) Is the proposed dam projects in the Study area include water supply purpose to domestic and irrigation water use ?

5. Water Quality Control

(1) Is the program or plan on the urban drainage and sewerage systems established?

(2) Is the water quality control standard and classification on the river and drainage issued by the local governments in the Maluku Province and Ambon City ?

(3) Is the idea, program or plan on the water quality control in the Study area available?

6. Environmental Issues

(1) Is the environmental conservation area designated in the Study area ?

(2) What is the serious adverse effects on social and natural environment to be induced by the flood control works and water resources development

7. Related Studies and Plans

Are there any previous studies and existing plans related to the Study as well as the following:

(1) Ambon Integrated Urban Infrastructure Development Project

(2) Urban Development Plan in Ambon City prepared by Cipta Karya

(3) Technical Planning and Countermeasures, Flood Natural Disaster Improvement Sub-Project and Maintenance of Maluku River

8. Availability of Local Consultant in the Study Area

(1) Are there any local consulting firms who have offices in Ambon City or Maluku Province ?

(2) Please list up the name of local consultant firms who have experience of carrying-out such consulting services in the Study area as topographic survey, geotechnical investigation, planning and design of flood control and water resources development works ?

(3) Which local consulting firms have the DGWRD employed for engineering studies and design in water sectors ?

II. Required Data

O: Available, X: Not Available, ☆: Date to be Collected

Data/Item	Availability (O or X)	Source	During Preliminary Study	Initial Stage of Master Plan Study	Remarks
1. General					
1-1 National development plan (existing long-term plan or five years plan)			☆		
1-2 Sectoral and regional development plans related the Study					
(1) Regional Development Plan			☆		
(2) Flood control			☆		
(3) Agriculture			☆		
(4) Water supply			☆		
(5) Hydropower Generation			☆		
(6) Transmigration			☆		
(7) Environmental conservation			☆		
1-3 National census related to the Study			☆		
1-4 Socio-economic conditions in the Study area					
(1) Administrative district (city, town and village)			☆		
(2) Population and household			☆		
(3) Land use			☆		
(4) Infrastructure			☆		
a) Road condition					
b) Transportation					
c) Electricity					
d) Telecommunication/postal service					
e) Potable water supply					
f) Wells					
(5) Industry			☆		
(6) Agriculture (irrigation)			☆		
(7) Tourism and historical area			☆		
1-4 Budget in the last five years					
(1) National budget by ministry					
(2) Ministry of Public Works					

O: Available, X: Not Available, ☆: Date to be Collected

Data/Item	Availability (O or X)	Source	During Preliminary Study	Initial Stage of Master Plan Study	Remarks
(3) Flood Control and Water Resources Development Projects					
(4) Maintenance cost for road, bridges, flood control facility and etc. in the Cisadane-Ciliwung River Basin Development Project					
(5) Annual Report of the Directorate general of Water Resources Development (DGWRD)					
1-5 Institution and Organization					
(1) Structures and key functions of the following organizations, their interrelations and their relations with other government agencies. A diagram shown interrelation of the organizations and other governmental agencies.					
a) Directorate General of Water Resources Development (DGWRD)			☆		
b) Directorate General of Human Settlement (CIPTA KARYA)			☆		
c) Project Office in the Study area			☆		
(2) Their capitalization, budgeting and funding and their recent summarized financial statements.					
(3) Function and/or job-description of each division, section, and sub-section of the above organizations including the number of staff.					
(4) Other agencies concerned with the projects, if any. Their key functions and government financial supports they receive.					
(5) Any involvement of local government, their key functions and financial supports by government.					
2. Topography, Geology and Land Use					
2-1 Topographic maps					
(1) Scale 1:250,000			☆		
(2) Scale 1:40,000			☆		
(3) Scale 1: 5,000			☆		
(4) Control point (location and altitude)			☆		
(5) Available maps related to the basins and effective for the Study					
2-2 Geological maps					
(1) Scale 1: ,000			☆		
(2) Available maps related to the basins and effective for the Study					
2-3 Design drawings of the completed/on-going/proposed river improvement projects					
(1) Plan of river improvement			☆		
(2) Longitudinal profile and cross-section of river improvement			☆		

O: Available, X: Not Available, ☆: Date to be Collected

Data/Item	Availability (O or X)	Source	During Preliminary Study	Initial Stage of Master Plan Study	Remarks
(3) River width in major reaches or points			☆		
(4) Channel depth in major reaches or points			☆		
(5) Variations of river course and river bed in the past			☆		
2-4 Aerial photographs (the latest photos)					
(1) Shooting year;					
(2) Scale of photographs; 1: ,000					
(3) Drawing area					
(4) Scale of drawing; 1: ,000					
(5) Interval of counter line; m					
(6) Control point (location and altitude)					
(7) Triangulation station					
(8) Permission for the Study Team to take them our to Japan					
2-5 Land use maps					
(1) Investigation/Publication year;					
(2) Scale; 1: ,000			☆		
3-1 Location map of meteorological and hydrological observation stations					
(1) Rain gauge stations			☆		
(2) Stream flow gauging stations			☆		
(3) Tide gauge stations			☆		
(4) Flood warning stations			☆		
3-2 List of meteorological and hydrological observation stations					
(1) Stations name			☆		
(2) Location/Address			☆		
(3) Code number of station			☆		
(4) Observation items			☆		
(5) Period of observation			☆		
(6) Authorities concerned			☆		
3-3 General climate at major stations			☆		
3-4 Specific climate on rainfall, wind and tide ever recorded at major stations			☆		

O: Available, X: Not Available, ☆: Date to be Collected

Data/Item	Availability (O or X)	Source	During Preliminary Study	Initial Stage of Master Plan Study	Remarks
3-5 Hydrological data during storms which caused major historical floods in the Study Area					
(1) Hourly rainfall of major storm at major stations			☆		
(2) Hourly hydrograph of major flood flow at major stations			☆		
(3) Probable rainfall intensities for the duration of 1, 2, 3, 4, 6, 12, 18 and 24 hours			☆		
(4) Isohyetal maps			☆		
3-6 Rainfall data at major stations					
(1) Monthly rainfall			☆		
(2) Authorities concerned			☆		
3-7 Water level and discharges at major stations					
(1) Monthly runoff			☆		
(2) Annual maximum water level and discharge, and their frequencies			☆		
(3) Hourly water level and discharge of major flood observed			☆		
(4) Discharge rating curve			☆		
(5) Method of discharge observation			☆		
(6) Authorities concerned			☆		
4. Flood Control and Relevant Information					
4-1 Report, record and information on the past flood damage in the river basins					
(1) Occurrence year			☆		
(2) Cause of flooding			☆		
(3) Inundation area and damage to agricultural crops, houses/buildings and properties			☆		
(4) Damage to flood control facilities and other infrastructures such as bridges, roads, railway, dams and irrigation weirs			☆		
(5) Degree of river bank erosion and extent			☆		
(6) Extent of soil erosion, if any			☆		
4-2 Present condition of existing flood control facilities in the Study Area			☆		
4-3 Information regarding the completed/ongoing/proposed flood control projects in the Study Area					
(1) Projects name			☆		
(2) Title and contents of project reports			☆		

O: Available, X: Not Available, ☆: Date to be Collected

Data/Item	Availability (O or X)	Source	During Preliminary Study	Initial Stage of Master Plan Study	Remarks
5. Present Water Use and the Development Plans					
5-1 Existing condition of water use					
(1) Irrigation			☆		
(2) Industrial and domestic water supply			☆		
(3) Hydropower Generation			☆		
(4) Navigation			☆		
(5) Others					
5-2 Existing systems and development projects including their locations					
(1) Irrigation			☆		
(2) Industrial and domestic water supply			☆		
(3) Hydropower Generation			☆		
(4) Navigation			☆		
(5) Others					
5-3 Documents related to the existing and proposed water use/development projects			☆		
5-4 Documents related to the existing and proposed water quality control projects			☆		
6. Environmental Conditions					
6-1 Question The following questions are useful for preliminary environmental survey. Please describe present situation.					
(1) Resettlement					
a) Existence of people to be resettled with project implementation. If any, plan of resettlement area and compensation plan.					
b) Experience of resettlement in implemented projects, if any.					
c) Cultural or religious characteristics to be mentioned especially related to the project.					
d) Existence of ethnic minorities, if any, the sites and the population.					
(2) Economic activities					
a) Probability of loss of economic opportunity with project.					
b) Negative economic structural change in society with project.					
(3) Transportation and living condition					

O: Available, X: Not Available, ☆: Date to be Collected

Data/Item	Availability (O or X)	Source	During Preliminary Study	Initial Stage of Master Plan Study	Remarks
a) Negative impact given into the existing public facilities such as schools, hospitals and religious facilities with new transportation system. If any, their locations.					
(4) Community					
a) Existence of communities which will be split by the project. If any, their locations.					
(5) Cultural property					
a) Existence of cultural property in the project area, if any, their locations.					
(6) Water right					
a) Negative influence of the project upon the customary water use such as domestic, industry and agriculture, if any, their present conditions.					
(7) Sanitation					
a) Negative impact given into living environment with project.					
(8) Solid waste					
a) Probability of producing solid waste such as residual soil and water pollution. If any, collection and disposal plan.					
(9) Terrain					
a) Existence of valuable topographies, if any, the sites					
b) Change of them with civil works					
(10) Soil erosion					
a) Probability of soil erosion with land reclamation and clearing forest.					
(11) Groundwater					
a) Experience of drying-up of groundwater or groundwater pollution.					
(12) Lake, river					
a) Change of present flowing condition due to rehabilitation works.					
(13) Coastal land					
a) Existence of littoral sand drift					
b) Existence of coastal erosion					
(14) Ecosystem					
a) Existence of environmentally valuable areas such as mangrove forest, coral reef, tidal land, swamp land. If any, their sites.					
b) Existence of particular areas officially protected such as natural parks and national parks. If any, their sties.					
c) Existence of valuable ecosystem officially protected. If any, their kinds or species.					
(15) Landscape					
a) Existence of important landscape or scenery for tourism or religious. If any, the sites.					

O: Available, X: Not Available, ☆: Date to be Collected

Data/Item	Availability (O or X)	Source	During Preliminary Study	Initial Stage of Master Plan Study	Remarks
(16) Water pollution					
a) Present condition of water quality. If water pollution, the source.					
(17) Soil contamination					
a) Existence of soil contamination. If any, the source and degree.					
(18) Land subsidence					
a) Existence of land subsidence with groundwater development.					
b) Existence of important landscape or scenery for tourism or religious. If any, the sites.					
6-2 Conformation items					
(1) Works by Japanese Study Team during full-scale study.					
The following surveys in accordance with Decree of the Minister of Public Works.					
AMDAL (Environmental Impact Assessment)					
- Preliminary Study					
- KA (Terms of Reference) of ANDAL (Environmental Impact Study)					
- ANDAL + RKL (Environmental Management Plan)/RPL (Environmental Monitoring Plan)					
6-3 Reports or documents to be collected					
(1) Existing data/report of similar projects on Environment Impact Assessment.					
(2) As for procedure of environment impact assessment, if there are any Decree/Regulations to be considered for this study besides the Decree of the Minister of Public Works PP No.51/93, their documents/reports.					

O: Available, X: Not Available, ☆: Date to be Collected

Data/Item	Availability (O or X)	Source	During Preliminary Study	Initial Stage of Master Plan Study	Remarks
7. Additional Data Required					
7-1 Policy on Water Resources Development including Flood Control in Repelita VI and PJPT II (Long Term Development Stage II)			☆		
7-2 River Law in Indonesia			☆		
7-3 General location map clearly showing the Study area in A4 size paper			☆		
7-4 Data on the extension plan of Ambon Airport, indicating extension area, implementation program and the related rivers			☆		
7-5 Geological and soil mechanical investigation results carried out in the Study area			☆		
7-6 River cross sections surveyed in the objective river basins			☆		

THE STUDY ON FLOOD CONTROL FOR AMBON CITY
ANSWER TO QUESTIONNAIRE

1. General

(1) Background of request for the Study

Ambon city (Kotamadya Ambon) with a total area of 360 km2 and population of 277 thousand is a capital of Maluku Province, and is located in the Ambon island. Within Ambon city area, the downtown area has been developed in an area of about 400 ha in flat plain, where the Ruhu, Batu Merah, Tomu, Batu Gajah and Batu Gantung rivers flow down and pour into the Ambon Bay.

The downtown area has suffered from flooding of the aforesaid five (5) rivers and therefore, the Ministry of Public Works has provided river improvement works, mainly construction of concrete parapet walls along the rivers, since 1970's. In the recent years, however, flooding and drainage congestion occurred in 1984, 1989 and 1991, and caused the severe flood damages for an area of about 100 ha due to deterioration of the existing flood control and drainage facilities, which are insufficient to cope with rushing flood flow from the steep mountainous area and high intensity of heavy rainfall.

While, Ambon city is rapidly growing in economy based on the national development program for the eastern region, and flood damage potential also rises with a high rates.

In order to cope with the mentioned circumstances, it is necessary to urgently establish a flood control master plan covering the aforesaid five (5) rivers and to carry out a feasibility study for priority project(s) so as not to hamper the development momentum and the promotion of welfare of the people in the area.

(2) Scope of the Work

The scope of the work for the Study is basically accepted. The following considerations is required to be taken in the Study:

(a) Currently, the Study area covers the five (5) river basins. However, it is strongly requested that the Samal and Kobi river basins are incorporated with the proposed Study area. These river basins are located in Pasahari area of the Seram island and the irrigation systems are being developed under the economic development program in the eastern region. But, the low land areas along the rivers are habitually inundated and properties of inhabitants and produced agricultural crops are damaged every year. To mitigate the mentioned the flood damages in the area, it is necessary to provide a conceptual idea or plan for flood control as a pilot area for flood control works in the Seram island and many areas under the similar flooding situation.

(b) It is necessary to consider such multiple use of flood control facilities as stabilization of fluctuating river flow by flood control dam which may contribute to domestic water supply and maintain/improve river water quality.

(c) It is considered that social environmental impact to be induced by lead acquisition along the river is one of significant matters dominating project viability for river and drainage improvement works, since the river-side areas are densely built up, closely to the edge of the existing parapet wall. This matter is duly considered in IEE and EIA as well as setting-up and selection of alternative plans for flood control.

(3) Counterpart agency

- Directorate General of Water Resources Development
- Public Works of Maluku Provincial Government

(4) Relevant Organization

- CIPTA KARYA for drainage
- BINA MARGA for road and bridges
- BAKOSURTANAL for topographic mapping
- KLH for environmental management
- BMG for meteorological data
- BPS for statistic data

- BAPPEDA for local development plan
- KANWIL PU for coordination of planning
- DINAS/KANWIL Pertanian for agricultural aspects
- DINAS/KANWIL Kehutanan for forestry aspects
- PDAM Ambon for domestic water supply
- BPN for land acquisition

2. Flood Control

(1) Reason of Flooding

Flooding in the Study area are caused by; river overbanking, poor drainage system, poor maintenance of the existing river channel, parapet walls and dyke, change of land use in the upstream area of river basins, and deposition of garbages in the river channel.

(2) Flooding Conditions

There is no systematic statistic data on flood damages in the Study area. It is suggested to estimate those on the basis of socio-economic data, topographic maps, and other relevant data. In order to estimate properties of households in inundation area, hearing survey to households may be necessary. Habitual inundation area is delineated in the map.

(3) Land Acquisition

It is predicted that it is difficult to acquire land in the downtown area in Ambon city due to limited fund for compensation cost remarkably rising, and lack of resettlement area acceptable for inhabitant to be replaced.

It is necessary to provide an idea or plan by the Study for smoothly carrying-out land acquisition and resettlement.

(4) Flood Protection Level

For the Study, "Flood Control Manual" is available. This manual comprises three (3) volumes; volume I: Summary of Flood Control

Criteria and Guidelines; volume II: Guidelines for Planning and Surveys; and volume III: Guidelines for Design and Implementation.

(5) Priority Area

The DGWRD currently considers that flood control works along the five (5) rivers have urgency and priorities at the same level since the area is already urbanized and important for economic activities, and that it is necessary for making decision on first priority project(s) to provide a strategy for implementation of the works, taking into account flood protection level, magnitude of social and natural environmental impacts, project cost, the governmental budget, etc. by the Study.

(6) Assets to be protected

The residential, commercial, industrial and agricultural areas, religeous place, and histrially important buildings should be protected at the appropriate level of safety against flood.

(7) Future Land Use Plan

Future Land Use Plan in Ambon City has been established by the local government of Ambon City, of which target year is 2005.

(8) Progress of Relevant Plan

Mainly, the maintenance work for the existing river structures has been made. In addition, three (3) check dams were constructed in the Tomu and Batu Merah river basins to control sediment inflow into the downstream river channel in these years.

Also, the DGWRD has a flood control plan which comprises river improvement works in the Ruhu and Batu Gantung rivers, and construction of three (3) flood control dams in the Tomu, Batu Merah and Batu Gajah rivers. But, these works are still under examination and therefore, the Study should review the mentioned plan for establishing the master plan.

(9) Viability of Dam Scheme

The envisaged dams will be suitable from technical view points for flood control. However, the viability of these dam schemes should be reviewed from technical, economical and environmental aspects comprehensively.

3. River Basin Management

Importance of river basin management including flood plain management has been recognized by the DGWRD. In the Study area, land conservation area is planned by the local government and reforestation may be carried out by other agency. However, with respect to flood plain management, there is no activity at present and therefore, realistic idea and measures of flood plain management works for mitigating flood damages are expected to be recommended by the Study.

4. Water Resources Development

(1) Present Situation

Water supply system operated by PDAM is a major water user in the Study area. The existing system of PDAM distributes treated water to about 26% of total population (223,287) in the service area in 1993, using water sources of spring water and deep groundwater. It is considered that other residents and industrial and commercial sectors are obtaining water from groundwater source, independently.

(2) Water Supply Plan

PDAM established the water supply plan by the year of 2010. In the plan, the existing supply capacity of 143 l/s is extended to 743 l/s until 2010, using spring water (501 l/s), deep groundwater well (125 l/s) and river water in the Air Besar and Way Lela rivers (117 l/s).

(3) Purpose of the Envisaged Flood Control Dams

Currently, the envisaged dam schemes are not planned to have function or purpose of domestic water supply. However, possibility of

effective use of storage capacity for flood control is required to be examined for effective use of water resources in the Study area.

5. **River Water Quality Control**

There is no activity for river water quality control since there is no water use of river water along the five (5) rivers.

6. **Environmental Issues**

(1) Conservation Area

The government of Ambon city plans that a part of the mountainous area in the southern city area is remained as conservation area.

(2) Adverse Effects

Social impacts due to land acquisition is predicted to be one of significant problem dominating project viability.

7. **Related Studies and Plan**

The following are available for the Study as related studies and plans:

- Rencana Struktur Tata Ruang Propinsi Daerah Tingkat I Maluku 2005
- Rencana Umum Tata Ruang Kota Ambon
- Rencana Penanggulangan Banjir Sungai Wai Ruhu, Wai Batu Merah, Wai Tomu, Wai Batu Gajah, Wai Batu Gantung dan Erosi di Kota Ambon
- Perencanaan Teknis dan Outline Plan Drainase Kota Ambon
- Water Supply Plan Prepared by Chipta Karya/PDAM
- Report on Detail Engineering Design for Eastern Island Urban Development Project

8. Availability of Local Consultant in the Study Area

There is three (3) or four (4) consulting firms who have offices in Ambon City. While, the DGWRD and Public Works of Maluku Province have employed local consulting firms in Java island for engineering survey, investigation, planning, design and construction supervision in Maluku Province in consideration of reliability and capability. The major consulting firms who have experience in engineering services in Maluku Province in the recent years are:

(1) PT. INDAH KARYA, Semarang
(2) PT. DACREA, Jakarta
(3) PT. BARUNADRI, Jakarta & Ambon
(4) PT. SOILENS, Jakarta
(5) PT. ARPLAN GEO ENCON, Jakarta

The list of major consulting firms in Indonesia is attached to this answer to questionnaire.

9. Present Situation in the Samal and Kobi River Basins

(1) Present Situation

The Samal and Kobi river basins are located in the northwestern part of the Seram island. In both the river basins, the Public Works of Maluku Province is developing irrigation area as follows:

	Samal River	Kobi River
Irrigation area	2,217 ha	2,898 ha
Annual Rainfall at Wahai	2,474 mm	2,474 mm
Cropping Intensity	202 %	293 %
Catchment area at intake weir site	140 km^2	172 km^2

There is no flood control works for the mentioned irrigation area. Therefore, these areas are habitually inundated and properties of inhabitants and agricultural crops are severelly damaged every year.

(2) Availability of Data Related Flood Control

The following are available to the Study:

- Detailed Design Report and Drawings for Kobi and Samal Irrigation Project including topographic maps with a scale of 1:2,000 and contour line of 0.5 m, 1995
- Topographic map with a scale of 1:100,000, covering whole catchment area of the Samal and Kobi river basins
- Master Plan Report prepared by the Third Irrigation Sector Project, 1990 (Volume I to III)
- Land use map in the Samal and Kobi river basins
- Statistic Data in Kabupaten Maluku Tengah including the Seram island

There is no systematic statistic data on flood damages.

II. Required Data

O: Available, X: Not Available, ☆: Date to be Collected

Data/Item	Availability (O or X)	Source	During Preliminary Study	Initial Stage of Master Plan Study	Remarks
1. General					
1-1 National development plan (existing long-term plan or five years plan)	O	4	☆		
1-2 Sectoral and regional development plans related to the Study					
(1) Regional Development Plan	O	4	☆		
(2) Flood control	O	3	☆		
(3) Agriculture	X	-	☆		
(4) Water supply	O	6	☆		
(5) Hydropower Generation	X	-	☆		
(6) Transmigration	X	-	☆		
(7) Environmental conservation	O	1	☆		
1-3 National census related to the Study	O	1	☆		
1-4 Socio-economic conditions in the Study area					
(1) Administrative district (city, town and village)	O	5	☆		
(2) Population and household	O	2	☆		
(3) Land use	O	5	☆		
(4) Infrastructure	O	3	☆		
a) Road condition	O	7			
b) Transportation	O	7			
c) Electricity	O	8			
d) Telecommunication/postal service	O	2			
e) Potable water supply	O	2			
f) Wells	O	3			
(5) Industry	O	5	☆		
(6) Agriculture (irrigation)	X	-	☆		
(7) Tourism and historical area	O	2	☆		
1-4 Budget in the last five years					
(1) National budget by ministry	O	1			
(2) Ministry of Public Works	O	3			

· O: Available, X: Not Available, ☆: Date to be Collected

Data/Item	Availability (O or X)	Source	During Preliminary Study	Initial Stage of Master Plan Study	Remarks
(3) Flood Control and Water Resources Development Projects	O	3			
(4) Maintenance cost for water use and flood control facilities, roads, bridges	O	3			
(5) Annual Report of the Directorate General of Water Resources Development (DGWRD)	X	-			
1-5 Institution and Organization					
(1) Structures and key functions of the following organizations, their interrelations and their relations with other government agencies. A diagram shown interrelation of the organizations and other governmental agencies.					
a) Directorate General of Water Resources Development (DGWRD)	O	3	☆		
b) Directorate General of Human Settlement (CIPTA KARYA)	O	6	☆		
c) Project Office in the Study area	O	3	☆		
(2) Their capitalization, budgeting and funding and their recent summarized financial statements.	O	3			
(3) Function and/or job-description of each division, section, and sub-section of the above organizations including the number of staff.	O	3			
(4) Other agencies concerned with the projects, if any. Their key functions and government financial supports they receive.	O	4			
(5) Any involvement of local government, their key functions and financial supports by government.	O	2			
2. Topography, Geology and Land Use					
2-1 Topographic maps					
(1) Scale 1:250,000	O	4	☆		
(2) Scale 1:40,000	X	-	☆		
(3) Scale 1: 5,000	O	6	☆		
(4) Control point (location and altitude)	X	-	☆		
(5) Available maps related to the basins and effective for the Study	O				
2-2 Geological maps					
(1) Scale 1: 250,000	O	9	☆		
(2) Available maps related to the basins and effective for the Study	O	9			
2-3 Design drawings of the completed/on-going/proposed river improvement projects					
(1) Plan of river improvement	O	1	☆		
(2) Longitudinal profile and cross-section of river improvement	O	1	☆		

O: Available, X: Not Available, ☆: Date to be Collected

Data/Item	Availability (O or X)	Source	During Preliminary Study	Initial Stage of Master Plan Study	Remarks
(3) River width in major reaches or points	O	1	☆		
(4) Channel depth in major reaches or points	O	1	☆		
(5) Variations of river course and river bed in the past	X	-	☆		
2-4 Aerial photographs (the latest photos)					
(1) Shooting year;	O	4			
(2) Scale of photographs; 1: 10,000	O	4			
(3) Drawing area	O	4			
(4) Scale of drawing; 1: 5,000	O	4			
(5) Interval of counter line; 2 m to 10 m	O	4			
(6) Control point (location and altitude)	X	X			
(7) Triangulation station	X	X			
(8) Permission for the Study Team to take them our to Japan	X	X			
2-5 Land use maps					
(1) Investigation/Publication year;	O	4			
(2) Scale; 1: 125,000	O	4	☆		
3-1 Location map of meteorological and hydrological observation stations					
(1) Rain gauge stations	O	1	☆		
(2) Stream flow gauging stations	O	1	☆		
(3) Tide gauge stations	O	-	☆		
(4) Flood warning stations	X	-	☆		
3-2 List of meteorological and hydrological observation stations					
(1) Stations name	O	3/MOT	☆		
(2) Location/Address	O	3/MOT	☆		
(3) Code number of station	O	3/MOT	☆		
(4) Observation items	O	3/MOT	☆		
(5) Period of observation	O	3/MOT	☆		
(6) Authorities concerned	O	3/MOT	☆		
3-3 General climate at major stations	O	3/MOT	☆		
3-4 Specific climate on rainfall, wind and tide ever recorded at major stations	O	3/MOT	☆		

O: Available, X: Not Available, ☆: Date to be Collected

Data/Item	Availability (O or X)	Source	During Preliminary Study	Initial Stage of Master Plan Study	Remarks
3-5 Hydrological data during storms which caused major historical floods in the Study Area					
(1) Hourly rainfall of major storm at major stations	X	-	☆		
(2) Hourly hydrograph of major flood flow at major stations	X	-	☆		
(3) Probable rainfall intensities for the duration of 1, 2, 3, 4, 6, 12, 18 and 24 hours	X	-	☆		
(4) Isohyetal maps	X	-	☆		
3-6 Rainfall data at major stations					
(1) Monthly rainfall	O	3/MOT	☆		
(2) Authorities concerned	X	-	☆		
3-7 Water level and discharges at major stations					
(1) Monthly runoff	X	-	☆		
(2) Annual maximum water level and discharge, and their frequencies	X	-	☆		
(3) Hourly water level and discharge of major flood observed	X	-	☆		
(4) Discharge rating curve	X	-	☆		
(5) Method of discharge observation	X	-	☆		
(6) Authorities concerned	X	-	☆		
4. Flood Control and Relevant Information					
4-1 Report, record and information on the past flood damage in the river basins					
(1) Occurrence year	O	3	☆		
(2) Cause of flooding	O	3	☆		
(3) Inundation area and damage to agricultural crops, houses/buildings and properties	O	3	☆		
(4) Damage to flood control facilities and other infrastructures such as bridges, roads, railway, dams and irrigation weirs	O	3	☆		
(5) Degree of river bank erosion and extent	X	-	☆		
(6) Extent of soil erosion, if any	O	3	☆		
4-2 Present condition of existing flood control facilities in the Study Area	O	3	☆		
4-3 Information regarding the completed/ongoing/proposed flood control projects in the Study Area					
(1) Projects name	O	3/6	☆		
(2) Title and contents of project reports	O	3/6	☆		

O: Available, X: Not Available, ☆: Date to be Collected

Data/Item	Availability (O or X)	Source	During Preliminary Study	Initial Stage of Master Plan Study	Remarks
5. Present Water Use and the Development Plans					
5-1 Existing condition of water use					
(1) Irrigation	X	-	☆		
(2) Industrial and domestic water supply	O	2	☆		
(3) Hydropower Generation	X	-	☆		
(4) Navigation	X	-	☆		
(5) Others	X	-			
5-2 Existing systems and development projects including their locations					
(1) Irrigation	X	-	☆		
(2) Industrial and domestic water supply	O	2	☆		
(3) Hydropower Generation	X	-	☆		
(4) Navigation	X	-	☆		
(5) Others	X	-			
5-3 Documents related to the existing and proposed water use/development projects	O	2	☆		
5-4 Documents related to the existing and proposed water quality control projects	O	3	☆		
6. Environmental Conditions					
6-1 Question The following questions are useful for preliminary environmental survey. Please describe present situation.					
(1) Resettlement					
a) Existence of people to be resettled with project implementation. If any, plan of resettlement area and compensation plan.	X	-			
b) Experience of resettlement in implemented projects, if any.	O	1			
c) Cultural or religious characteristics to be mentioned especially related to the project.	O	1			
d) Existence of ethnic minorities, if any, the sites and the population.	O	1			
(2) Economic activities					
a) Probability of loss of economic opportunity with project.	X	-			
b) Negative economic structural change in society with project.	X	-			
(3) Transportation and living condition					

O: Available, X: Not Available, ☆: Date to be Collected

Data/Item	Availability (O or X)	Source	During Preliminary Study	Initial Stage of Master Plan Study	Remarks
a) Negative impact given into the existing public facilities such as schools, hospitals and religious facilities with new transportation system. If any, their locations.	O	5			
(4) Community					
a) Existence of communities which will be split by the project. If any, their locations.	X	-			
(5) Cultural property					
a) Existence of cultural property in the project area, if any, their locations.	X	-			
(6) Water right					
a) Negative influence of the project upon the customary water use such as domestic, industry and agriculture, if any, their present conditions.	O	2			
(7) Sanitation					
a) Negative impact given into living environment with project.	O	6			
(8) Solid waste					
a) Probability of producing solid waste such as residual soil and water pollution. If any, collection and disposal plan.	O	6			
(9) Terrain					
a) Existence of valuable topographies, if any, the sites	X	-			
b) Change of them with civil works	X	-			
(10) Soil erosion					
a) Probability of soil erosion with land reclamation and clearing forest.	X	-			
(11) Groundwater					
a) Experience of drying-up of groundwater or groundwater pollution.	X	-			
(12) Lake, river					
a) Change of present flowing condition due to rehabilitation works.	X	-			
(13) Coastal land					
a) Existence of littoral sand drift	X	-			
b) Existence of coastal erosion	X	-			
(14) Ecosystem					
a) Existence of environmentally valuable areas such as mangrove forest, coral reef, tidal land, swamp land. If any, their sites.	X	-			
b) Existence of particular areas officially protected such as natural parks and national parks. If any, their sties.	X	-			
c) Existence of valuable ecosystem officially protected. If any, their kinds or species.	X	-			
(15) Landscape					
a) Existence of important landscape or scenery for tourism or religious. If any, the sites.	O	2			

O: Available, X: Not Available, ☆: Date to be Collected

Data/Item	Availability (O or X)	Source	During Preliminary Study	Initial Stage of Master Plan Study	Remarks
(16) Water pollution					
a) Present condition of water quality. If polluted, the source.	O	6			
(17) Soil contamination					
a) Existence of soil contamination. If any, the source and degree.	X	-			
(18) Land subsidence					
a) Existence of land subsidence with groundwater development.	X	-			
b) Existence of important landscape or scenery for tourism or religious. If any, the sites.	X	-			
6-2 Conformation items					
(1) Works by Japanese Study Team during full-scale study.					
The following surveys in accordance with Decree of the Minister of Public Works.					
AMDAL (Environmental Impact Assessment)					
- Preliminary Study	X	-			
- KA (Terms of Reference) of ANDAL (Environmental Impact Study)	X	-			
- ANDAL + RKL (Environmental Management Plan)/RPL (Environmental Monitoring Plan)	X	-			
6-3 Reports or documents to be collected					
(1) Existing data/report of similar projects on Environment Impact Assessment.	X	-			
(2) As for procedure of environment impact assessment, if there are any Decree/Regulations to be considered for this study besides the Decree of the Minister of Public Works PP No.51/93, their documents/reports.	X	-			
7. Additional Data Required					
7-1 Policy on Water Resources Development including Flood Control in Repelita VI and PJPT II (Long Term Development Stage II)	O	0	☆		
7-2 River Law in Indonesia	O	0	☆		
7-3 General location map clearly showing the Study area in A4 size paper	X	-	☆		
7-4 Data on the extension plan of Ambon Airport, indicating extension area, implementation program and the related rivers	O	MOT	☆		
7-5 Geological and soil mechanical investigation results carried out in the Study area	O	3	☆		
7-6 River cross sections surveyed in the objective river basins	O	3	☆		

O: Available, X: Not Available, ☆: Date to be Collected

Data/Item	Availability (O or X)	Source	During Preliminary Study	Initial Stage of Master Plan Study	Remarks
Related Agencies referred to in Columns of Data Source					
0 : DGWRD					
1 : Maluku Provincial Government					
2 : Ambon City Government					
3 : Dinas PU					
4 : Bappeda I					
5 : Bappeda II					
6 : Cipta Karya					
7 : Bina Marga					
MOT : Ministry of Transportation					

5．主要面会者リスト

公共事業省　水資源総局 (DGWRD)

Ir. Krenius Marpaung	計画局長
Ir. M. Hasan	計画局
Ir. Ruchyat Kustomi	〃
Dr. Sutardi	〃
Mr. Gultom	〃
Drs. Herwiryanto	〃
Ir. M. Yusuf Gayo	東部地域建設局長
Ir. Adi Sarwoko	〃
Mr. N. Ginting	〃
Ir. Hafied A. Gany	水資源保全局長
Ir. Rustam Syarif	水資源保全局
Ir. Handradjadi	マルク州地方局長
Ir. Happy Mulya	水工研究室員
Ir. Sri Hartono	パサハリ地区潅漑プロジェクト現場所長
Ir. S. G. Padaunan	パサハリ地区潅漑プロジェクト
Mr. Kiyofumi Yoshino	JICA 派遣長期専門家（水資源開発）

マルク州

Ir. Tedjo Poernomo	公共事業局
Ir. Pieter Mustamu	〃
Ir. Satoto Basuki	〃
Mr. J. Tamaela	〃
Mr. Yudha Medtawan	〃
Mr. Soetjipto	〃
Mr. Yosman Pabisa	都市局
Mr. Sojan Sitepu	農業局
Mr. R. Raplale	〃
Mr. CH. J. Pattinaja	水道局
Dr. Ir. Ms Latuconsina	州開発計画庁
Mr. Nz. Triz	〃
Mr. Hartoyo Kaleinas	〃

アンボン市

Mr. Johanes Sudijono	アンボン市長

鉱山エネルギー省

Mr. J. CA. Rahanra	地方局
Mr. J. Kantil	〃
Mr. Wikman Sitrus	〃

森林省

Mr. Herry Rousyikin	地方局

移住省

Mr. C. Kukuh Sutoto	地方局
Mr. T. A. Rumasuki	〃
Mr. Alax. Maniki	〃

農業省

Mr. A. R. Diakel	地方局

工業省

Mr. C. O. Louhenasessy	地方局

電力公社

Mr. Wirabuni K.	第９地方局
Mr. Hari Nugroho	〃

在インドネシア日本国大使館

塚原　健一	二等書記官

OECF ジャカルタ駐在員事務所

佐々木　篤	次席駐在員

JICA インドネシア事務所

岡崎　剛一郎	事務所長
竹内　智子	所員
Mr. Shunichi Kudo	所員
Ms. Dinur Krismasari	Project Officer

SPECIFICATION AND UNIT PRICE OF STUDY EQUIPMENT REQUESTED BY DGWRD

Item	Specification	Unit Price	Remarks
1. Long chassis four wheels drive vehicle ● VHF communication tools ● A/C ● Roof carrier ● Trailer hook			
2. Geo-electric prospecting equipment			
3. Electronic distance meter			
4. Current meter of direct reading type			
5. Sea bottom material sampler			
6. Electric conductivity meter			
7. Basic soil-mechanic test equipment			
8. Standard sieves			
9. Table computer			
10. Photocopy machine			
11. Voltage stabilizer	50kw, 220V		
12. Data processor with type-writer			
13. Topographic survey equipment			
14. Facsimile machine			

SPECIFICASI AND UNIT PRICE OF STUDY EQUIPMENT REQUESTED BY OGWRO

ITEM	SPECIFICATION	UNIT PRICE	REMARKS
1. Long chasis four wheels drive vehicle * VHF communication tools * A/C * Roof carrier * Trailer hook	DAIHATSU TAFT	Rp. 67,000,000	
2. Geo-electric prospecting equipment	BISON Signal enhancement resistivity meter 2350 R/T	Rp. 70,000,000	
3. Electric distancemeter	PENTAX, Model PCS-225	Rp. 45,000,000	
4. Current meter of direct reading type	SEBA Model F-1 + winch	Rp. 47,500,000	
5. Sea botton material sampler	RICKLY Bed material sampler USBM-54	Rp. 10,000,000	
6. Electric conductivity meter	HYDROLAB water quality data logger	Rp. 15,000,000	
7. Basic soil mechanic test equipment			
7.1. Liquid limit test		Rp. 400,000	
7.2. Plastic limit test		Rp. 150,000	
7.3. Compaction test		Rp. 1,000,000	
7.4. CBR test		Rp. 6,250,000	
7.5. Sand equivalent test		Rp. 1,250,000	
7.6. Dynamic cone penetrometer		Rp. 1,000,000	
7.7. Consolidation apparatus		Rp. 25,000,000	
8. Standard sieves	TANIFUJI Soil sieve set + shaker	Rp. 5,000,000	
9. Table computer	APPLE type AP-120	Rp. 400,000	
10. Photocopy machine	CANON NP-3130	Rp. 14,000,000	
11. Voltage Stabilizer 50 KW, 220 V	ICA	Rp. 6,000,000	
12. Data processor with type writer	MOGEN BESTBUY Pentium 100, SVGA Monitor + typewriter	Rp. 10,500,000	
13. Topographic survey equipment			
13.1. PENTAX automatic level AL-320 S		Rp. 4,500,000	
13.2. PENTAX Electronic theodolite ETH-20 F		Rp. 12,000,000	
13.3. PENTAX Electronic distance meter KO-14		Rp. 27,500,000	
13.4. Aluminium staf 5 meter, 5 section		Rp. 510,000	
13.5. Surveying pole 3 meter, 3 section		Rp. 75,000	
13.6. YAMAYO measuring tape, yeron reel 50 M		Rp. 350,000	
13.7. YAMAYA Digital planimeter Planix-7P		Rp. 3,900,000	
14. Facsimile machine	PANASONIC KX-F2510B	Rp. 2,000,000	

7. ローカルコンサルタントのリスト

Attachment : List of Major Consulting Firms in Indonesia

Name of Local Consulting Firms	Address	Director	Telephone No.
PT. Geo Ace	Wisma Benhill 6th Fl (Branch Office) Jl. Jend. Sudirman Kav. 36, Jakarta Jl. Pajajaran 125, Bandung (Main Office)	Ir. Sajiboen Soedarja	(022)-631113
PT. Tata Guna Patria	Jl. Bangka V, no. 18, Jakarta	Ir. John P. Pantouw, MS	(021)-7990585
PT. Team Indodesign Nuasantara	Jl. Durca Tiga Selatan VII, no. 7A, Wrg. Buncit, Jakarta	Ir. H. Kusmo Edi	(021)-7973264
PT. Wiratman & Associates	Jl. Bendungan Hillir Kav. 36, Blok B, no. 13-19, Jakarta	Dr. Wiratman Wangsadinanto	(021)-57733407
PT. Indha Karya	Jl. Ir. H. Juanda No. 63, Bandung	Ir. Sockadarjanto	(022)-433558
PT. Makarah Adiyasa	Jl. Tebet Timur Dalam no. 35, Jakarta	Ir. Sochardi	(021)-8300609
PT. Indra Karya	Jl. Biru Laut X Kav. 9, Cawang, Jakarta	Ir. Mahmudi Ali	(021)-8192636
PT. Kwarsa Hexagon	Jl. Rancang Bolang no. 36, Margahayu Raya, Soekarno Hatta, Bandung	Ir. Djoko Hartono	(022)-762107
PT. Asana Wirasta Setia	Plaza Bona Indah Blok A2 Kav. C-5, Jl. Karang Tengah, Lb.bulus, Jakarta	Ir. Adi Santosa	(021)-7501745
PT. Amythans Experts & Associates	Jl. Kawang Raya no. 17A, Jakarta	Ir. Moctjadi Sastrasoebrata	(021)-7194704
PT. Vitama Karya	Jl. Hang Tuah Raya No. 26, Jakarta	Ir. Koko Widayatmoko MSC	(021)-7244991
PT. Isuda Parama	Jl. Soekarno Hatta 24/206A, Bandung	Mr. Sukandar MBA	(021)-763911
PT. Transintra Asia	Jl. Sawo II no.4, Jakarta	Ir. Irsono Heru	(021)-7210466
PT. Yodya Karya	Jl. DI. Panjaitan Kav. 8, Cawang, Jakarta	Ir. Wonargo Marto Wirono	(021)-8193951
PT. Bhakti Werdhatama Consultant	Jl. Pattimura no. 20, XGI, Jakarta	Ir. Suwasono	(021)-7221285
PT. Barunadri Engineering Consultant	Jl. Bumi Harapan Raya, Blok M-2, Kramat Jati, Jakarta		(021)-8402044
PT. Bina Karya	Jl. DI. Panjaitan Kav. 2, Jakarta		(021)-8198445
PT. Gracia Widya Karya	Jl. Pndean Sampec III/10, Semarang		(024)-311868
PT. IKI Engineering	Jl. Sultan Hasanuddin no. 45, Kebayoran Baru, Jakarta	Mr. Hersono Herac	(021)-7203875

8．現地調査費経費資料

現地調査経費資料

ローカル・コンサルタント等からの聞き取り調査の結果による。
Rp. 1.00 = ¥ 0.0473 (1996年5月1日現在)

(1) 人件費 (流送土砂調査及び水質調査の場合)

項目	月額 (Rp)	日額 (Rp)
Geological/River Engineer	6,500,000	
Water Quality Engineer	6,500,000	
Surveyor	3,800,000	
Local Labour		30,000

(2) 人件費 (環境調査の場合)

項目	経験年数	月額 (Rp)
River Engineer (A)	14	5,400,000
River Engineer (B)	5	3,000,000
Resettlement Planning Expert	33	5,800,000
Hydrologist	18	5,400,000
Irrigation Engineer	5	3,000,000
Environmental Engineer	7	3,500,000
Environmentalist	8	4,200,000
Agronomist (A)	12	4,200,000
Agronomist (B)	8	3,700,000
Geotechnic/Geologist	6	3,200,000
Biologist (A)	16	5,800,000
Biologist (B)	14	5,400,000
Sociologist (A)	18	5,400,000
Sociologist (B)	14	4,700,000
Public Health Expert	21	5,800,000
Socio-Economist (A)	18	5,400,000
Socio-Economist (B)	8	5,400,000
Socio-Economist (C)	5	5,400,000
Asst. Engineer	—	710,000
Office Manager	—	710,000
Computer Operator	—	350,000
Draftman	—	350,000
Administrator	—	470,000
Office Boy/Security	—	240,000

（3）事務諸経費

項　目	月額 (Rp)
事務機器（ﾚﾝﾀﾙ：ｼﾞｬｶﾙﾀにて）	
Computers & Printer (5 units of PC 486/DX)	700,000
Foto Copy Machine	1,800,000
Drawing Tables	180,000

（4）測量

項　目	単 位	単価 (Rp)
1. Topographic Survey		
Monumentation	Point	450,000
Traversing	Km	650,000
Levelling	Km	500,000
Detail Survey	Ha	1,500,000
Fair Drawing	Ha	200,000
2. River Survey		
Monumentation	Point	450,000
Cross Section	Section	250,000
Levelling	Km	500,000
Traversing	Km	650,000
Detail Survey	Ha	1,000,000
Fair Drawing	Ha	450,000

（5）地質調査費

項　目	単 位	単価 (Rp)
1. 地質調査		
Installation of Drilling Machine	Location	1,950,000
Core Boring	m	425,000
Standard Penetration Test	nos	65,000
Permeability Test	nos	80,000
Lateral Load Test	nos	2,275,000
Undisturbing Sampling	nos	85,000
2. 地質試験費		
Specific Gravity	nos	25,000
Grading Analysis	nos	130,000
Liquid Limit, Plastic Limit	nos	40,000
Consolidation Test	nos	145,000
Unconfind Compression Test	nos	145,000
Triaxial Compression Test	nos	260,000

様式第1号

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1	アンボン沿岸域の1/1000地形図のインデックス	A1	1	コピー	1	Cipta Karya	寄贈	公開	
2	アンボン市洪水被害状況など（図面／写真含む）	A4/A1	30	オリジナル	1	吉野専門家	寄贈	公開	
3	第6次国家開発5カ年計画における水資源開発	A4	14	コピー	1	吉野専門家	寄贈	公開	
4	Country Paper, Water Resources Development and Management, Policy Review	A4	16	コピー	1	吉野専門家	寄贈	公開	
5	公共事業省水資源総局の概要	A4	9	コピー	1	吉野専門家	寄贈	公開	
6	水資源総局組織図	A4	7	コピー	1	吉野専門家	寄贈	公開	
7	Flood Control Policy	A4	14	コピー	1	吉野専門家	寄贈	公開	
8	インドネシア共和国河川法（日本語訳）	A4	40	コピー	1	吉野専門家	寄贈	公開	
9	気象資料月報（アンボン空港）	A4	4	コピー	1	Dinas PU	寄贈	公開	
10	気象資料月報（Kailolo Way Pia, Kobisonita, Amaina）	A3	176	コピー	1	Dinas PU	寄贈	公開	
11-14	気象資料月報（Kailolo Way Pia, Kobisonita, Amaina: 1993-1994）	A4	134	コピー	1	Dinas PU	寄贈	公開	
15－1	アンボン市5河川の河川改修計画（主報告書）	A4	180	コピー	1	Dinas PU	寄贈	公開	
15－2	アンボン市5河川の河川改修計画（設計書）	A4	146	コピー	1	Dinas PU	寄贈	公開	
17	1/5000地形図（5河川流域を含むアンボン島）	A1	56	コピー	1	Bappeda	寄贈	公開	
18	アンボン市開発計画（1993/1994）	A3	100	コピー	1	Bappeda	寄贈	公開	
19	アンボン市内の排水計画	A4	300	コピー	1	Cipta Karya	寄贈	公開	
20-1	アンボン市水供給計画（要約）	A4	60	コピー	1	Cipta Karya	寄贈	公開	
20-2	アンボン市水供給計画（主報告書）	A4	190	コピー	1		寄贈	公開	
21	アンボン市5河川の河川改修計画（要約）	A4	50	コピー	1	Dinas PU	寄贈	公開	
22-1	シクラ川河川改修計画（要約）	A4	40	コピー	1	Dinas PU	寄贈	公開	
22-2	シクラ川河川改修計画（主報告書）	A4	150	コピー	1	Dinas PU	寄贈	公開	
23	アンボン島／セラム島地質図（1:250,000）	A1	2	コピー	1	Ministry of Mining and Energy	寄贈	公開	
24	Kairatu温泉地区概要図（1:25,000）	A1	1	コピー	1	Dinas PU	寄贈	公開	
25	アンボン空港拡張計画	A1	2	コピー	1	Ministry of Transportation	寄贈	公開	
26	Pasahari地区土地利用図（1:50,000）	A1	1	コピー	1	PU Pasahari Irrigation Project	寄贈	公開	
27	アンボン市行政区分図	A0	1	コピー	1	Ambon City Government	寄贈	公開	

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28	Dinas PU 組織図	A4	11	コピー	1	Dinas PU	寄贈	公開	
29	地下水ポテンシャル図（アンボン市）	A2	1	コピー	1	Cipta Karya	寄贈	公開	
30	アンボン水道公社システム図	A2	1	コピー	1	Cipta Karya	寄贈	公開	
31	アンボン市水道水源位置図	A2	1	コピー	1	Cipta Karya	寄贈	公開	
32	アンボン市人口統計（Dalam Angkaより抜粋）	A4	3	コピー	1	Statistic Office in Ambon	寄贈	公開	
33	Riuapa川河道縦断図	A2	1	コピー	1	Dinas PU	寄贈	公開	
34	Way Nala川河道縦断図	A2	1	コピー	1	Dinas PU	寄贈	公開	
35	アンボン市土地利用図	A1	1	コピー	1	Provincial Government	寄贈	公開	
36	アンボン市内5河川の既存河川施設／氾濫域図	A1	1	コピー	1	Bappeda I	寄贈	公開	
37	1/100.000地形図（Kobi/Samal川流域）	A1	2	コピー	1	East Region Implememntation	寄贈	公開	
38-1	Pasahari地区灌漑開発基本計画（1990）－主報告書	A4	50	コピー	1	PU Pasahari Irrigation Project	寄贈	公開	
38-2	Pasahari地区灌漑開発基本計画（1990）－技術報告書	A4	170	コピー	1	PU Pasahari Irrigation Project	寄贈	公開	
38-3	Pasahari地区灌漑開発基本計画（1990）－付属資料	A4	100	コピー	1	PU Pasahari Irrigation Project	寄贈	公開	
39	Samal川流域灌漑プロジェクト要約（1994）	A4	100	コピー	1	PU Pasahari Irrigation Project	寄贈	公開	
40	Kobi川流域灌漑プロジェクト要約（1994）	A4	100	コピー	1	PU Pasahari Irrigation Project	寄贈	公開	
41	Dalam Angka（中部マルク県）－1994	A4	360	コピー	1	Statistic Office in Ambon	寄贈	公開	
42	Dalam Angka（アンボン市）－1994	B5	220	コピー	1	Statistic Office in Ambon	寄贈	公開	
43	気象資料（アンボン空港、1986-1990）	A4	61	コピー	1	Ministry of Transportation	寄贈	公開	
44	気象資料（アンボン空港、1991-1995）	A4	121	コピー	1	Dinas PU	寄贈	公開	
45	アンボン湾潮位資料（1995-1996）	B5	13	コピー	1	Ministry of Transportation	寄贈	公開	
46	セラム島Ruiapa川水質資料	A4	1	コピー	1	Kanwill PU（水工試験所）	寄贈	公開	
47	水質試験単価（公共事業省　水工研究所単価）	A4	1	コピー	1	Kanwill PU（水工試験所）	寄贈	公開	
48	ボーリング／土質試験単価（公共事業省　現地試験所）	A4	7	コピー	1	Kanwill PU（水工試験所）	寄贈	公開	
49	1984年洪水氾濫域図	A0	1	コピー	1	Bappeda I	寄贈	公開	
50	マルク州開発計画（2005年）	A4	500	コピー	1	Bappeda I	寄贈	公開	

国際協力事業団　　担当課控

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51	1/100,000地形図（アンボン島）	A1	4	コピー	1	East Region Implementation	寄贈	公開	
52	Flood Control Manual	A4	50	コピー	1	Bina Program	寄贈	公開	
53	サマール川およびコビ川洪水氾濫情報	A3	2	オリジナル	1	PU Pasahan Irrigation Project	寄贈	公開	

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