

フィリピン
水産物流通システム整備計画調査
(第二段階調査)
作業監理チーム報告書

昭和59年11月

国際協力事業団

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国際協力事業団

国際協力事業団	
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は し が き

現在、フィリピン国内には政府所有及び民営の製氷冷蔵施設があるが、ほとんどがルソン島に集中している。このため、地域によっては氷不足の状態をきたしており、水産物の偏在による高廃棄率地域と魚介類不足地域の同時存在、高生産が可能な漁場での低生産性、鮮魚を加工品に回さざるを得ないことによる商品価値の低下等の問題を生じている。同国政府は上記の問題を解決するため、全国の小規模漁港整備に関連して、製氷冷蔵施設等の建設を計画し、そのためのマスタープラン調査を1983年(昭和58年)4月、我が国に要請してきた。

この要請に対し、当事業団は、フィリピン政府との間で同年9月、58年度、59年度の2か年にわたる調査の実施を取り決め、コンサルタントによる本格調査を開始した。

調査の初年度である58年度においては、既存製氷冷蔵施設の現況評価、フィリピン漁業開発公社(PFDA)による予備調査のレビュー、水産物生産ポテンシャルの把握、水産物・氷の輸送、流通特性の把握、製氷冷蔵施設の地域別必要量予測等の調査を行った。この第一段階調査の結果、小規模な製氷冷蔵施設は、財務的に成立しないとの結論を得、調査団はいくつかの製氷冷蔵施設をとりまとめ組織化したゾーンシステム導入の基本方針を示した。

この基本方針の下、59年度においては、ゾーンシステム導入可能地区の踏査、第一段階調査の全国及びRegion別予測値の修正とゾーン別予測値への分割等の作業を経た後、最終的に全国製氷冷蔵施設ネットワークシステムの基本計画を提示することになっている。

当事業団は、59年度現地調査終了間近の昭和59年9月25日から10月4日までの10日間にわたり、山本忠日本大学経済学部教授を団長とする作業監理チームを派遣し、本調査の進捗状況及び問題点を把握し調査の円滑な実施に資するとともに、最終報告書作成の方向性についてフィリピン政府当局と協議を行った。本報告書は同調査団の調査結果をとりまとめたものである。

最後に、本調査団派遣に際し御協力を賜わった外務省、農林水産省及び在フィリピン日本大使館の関係各位に対し深甚なる謝意を表する次第である。

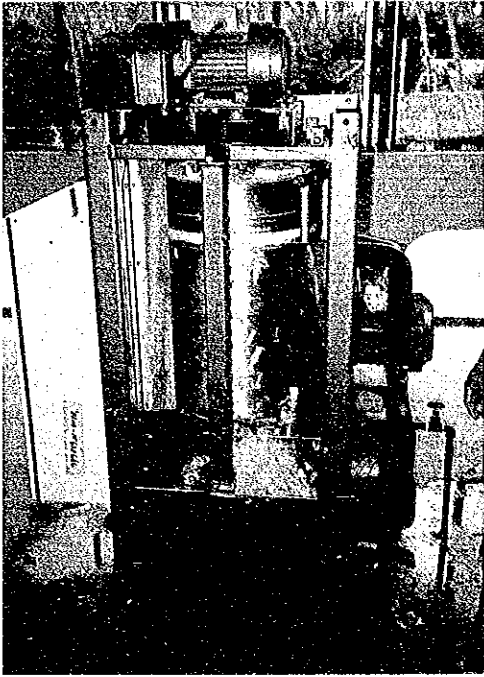
1984年11月

国際協力事業団

林業水産開発協力部長

渡 辺 桂

Bayawan 漁業協同組合

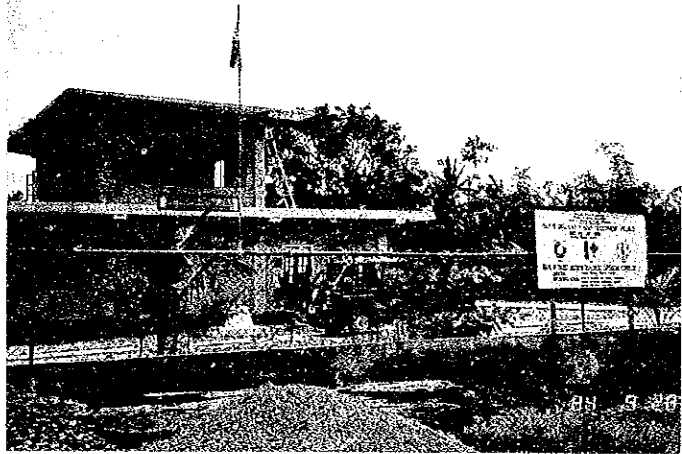


製氷施設 (Dumaguete)

CIDAにより提供されたデンマーク製のフ
レック氷製氷装置。

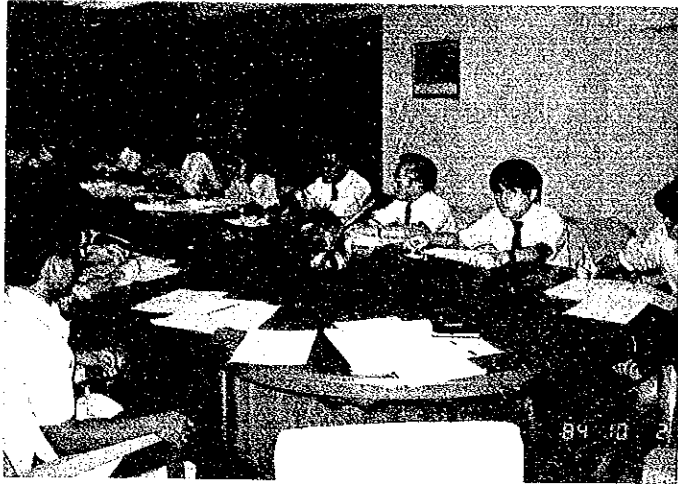
Bayawan 漁業協同組合事務所

この建物の2階に製氷施設、1階に事務室と
貯氷庫等がある。



保 冷 車

漁業協同組合が主要消費地であるDumaguete
まで水産物を輸送するのに使っているもので
ある。(日本製)



合同作業監理委員会

日本側（右より）

影山	山智	将
森川	川	貫
山本	本	忠
草野	野	夫
富山	山	保
矢花	花	男
杉山	山	一

フィリピン側（左より）

Facundo R. Yeneza, Jr.
 Cecilia Reyes
 Rodolfo Madrid
 Aurora B. Marcos
 Malcolm I. Sarmiento
 Manuel S. J. de Leon
 Aristeo Portugal



フィリピン水産物流通システム整備計画調査

(第二段階調査)作業監理チーム報告書

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1 調査団派遣の経緯及び目的

フィリピン全国を対象とする水産物流通システム整備の一環として、製氷冷蔵施設の全国的ネットワーク作成を目的とするマスタープラン調査の実施要請が、昭和58年(1983年)4月フィリピン政府から我が国に対し提出された。当事業団はこれを受けて、同年8月事前調査団を派遣し、フィリピン側の要請内容の確認及び協議を行い、昭和58、59年度の2か年間にわたる調査の実施内容の取決めを行った。

同取決めに基づき、JICAはシステム科学コンサルタンツ㈱と業務実施契約を結び、本格調査を開始した。そして、ある昭和58年度には、第一段階調査として、既存製氷冷蔵施設の現況評価、フィリピン漁業開発公社(PFDA)による予備調査のレビュー、水産物生産ポテンシャルの把握、水産物・氷の輸送、流通特性の把握、製氷冷蔵施設地域別必要量予測等を行い、その結果、極めて小規模な製氷冷蔵施設(日産5トン未満)は財務的に成立しない等の結論を得た。その結果調査団は幾つかの製氷冷蔵施設の設置予定地をグルーピングしたゾーン・システム導入の基本方針を示した。この第一段階調査の結論を受け、59年度には第二段階調査として次の調査が行われている。

- ① ゾーンシステム導入可能性のある候補地区の決定と現地踏査の実施
- ② 第一段階調査により得られた全国及びRegion別予測値の修正
- ③ Region別予測値のゾーン別分割及び製氷冷蔵施設必要量、適正仕様等計画条件の明確化
- ④ 水産物生産、技術、市場、経済・財務、運営の各要因を考慮した基本計画(マスタープラン)の作成

当事業団は、59年度現地調査終了間近の昭和59年9月25日から10月4日までの10日間にわたり、山本忠日本大学経済学部教授を団長とする作業監理チームをフィリピンに派遣し、調査作業の進捗状況及び問題点を把握し、コンサルタントに対して調査結果の取りまとめ、問題解決のために必要な助言・指導を行った。さらに、合同作業監理委員会を開催し、フィリピン国政府に対して現地調査結果の概略説明を行うとともに、最終報告書とりまとめの方向性についての協議を行った。

また、製氷冷蔵施設運営計画検討の参考に資するため、CIDAの援助によるNegros Oriental 県の Bayawan にある小規模水産業開発プロジェクトの運営状況の視察を行った。

2 調査団構成

作業監理チームは山本忠団長以下3名で構成された。

(氏名)	(担当業務)	(現職)
山本 忠	総括・団長	日本大学経済学部教授
森川 貫	施設運営	(社)日本水産物輸入協会専務理事
影山 智将	業務調整	国際協力事業団林業水産開発協力部水産業技術協力室

3 調査日程

作業監理チームは昭和59年9月25日～10月4日の10日間、以下の日程に従い調査を行った。

日順	月日	曜日	行 程	調 査 内 容
1	9/25	火	PR431 東京 → マニラ 10:15 13:25	・大使館、JICA事務所表敬
2	26	水		・現地調査団との打合せ
3	27	木	PR249 マニラ → デュマゲテ	・CIDAのプロジェクト調査(デュマゲテ) - Dumaguete Fish Cold Storage
4	28	金	デュマゲテ ↔ バヤワン PR368 デュマゲテ → セブ PR862 → マニラ	・CIDAのプロジェクト調査(バヤワン) - Bayawan Fish Handling Complex
5	29	土		・マニラ周辺の主要予定サイト調査 (オバンド、ハゴノイ、ナボタス)
6	30	日		・資料整理
7	10/1	月		・BFAR表敬 ・現地調査団との打合せ
8	2	火		・PFDA表敬 ・合同委員会
9	3	水		・資料整理及び議事録とりまとめ
10	4	木	PR432 マニラ → 東京 14:20 19:20	・大使館、JICA事務所報告

4 主な面会者

Aurora B. Marcos	農業食糧省 (MAF) 次官
Malcolm I. Sarmiento	農業食糧省 (MAF) 漁業開発公社 (PFDA) 次長
Facundo R. Yeneza	” 計画・開発部長
Linda J. Po	” 商業開発担当
Romualdo S. Corrales	Bayawan 漁業協同組合養殖専門家
Cezar V. Guerrelo	” 市場流通専門家
Epimaco Gantalao	” 協同組合専門家
Francisco Aluiola	デユマゲテ水産物流通施設所長

松浦由和	在マニラ日本大使館一等書記官
御手洗章弘	JICA マニラ事務所長
岡崎有二	JICA マニラ事務所職員
草野千夫	システム科学コンサルタンツ・リーダー
富山保	システム科学コンサルタンツの要員
矢花昭夫	”
杉山恭一	”
井上孝	”
土居正典	”

5 調査概要

本チームが行った作業内容のうち主なものは、(1)現地調査団の第二段階調査結果のレビュー (2) Bayawan 漁業協同組合の視察 (3) 合同作業監理委員会の開催の3点に要約される。

5.1 現地調査団第二段階調査結果のレビュー

JICA 現地調査団は第二段階調査のため昭和59年(1984年)6月25日より10月7日まで比国に滞在し、PFDA及びその他の関係官庁の緊密な協力を得て、Nation-wide Ice Plant and Cold Storage (IPCS) Network System について、IPCS の必要と考えられるサイトの選定と製氷施設の必要量の算定を完了した。IPCS のサイトは、第一段階調査の結果得られた基本方針に従い、(1)IPCS の効率的運営を考えて選定された特定のゾーンの中で選ばれるもの (Zone System) と、(2)これらゾーン以外の地域

から独立に選ばれるもの (Proto-type Site) とに分かれる。調査団はこの方針に基づいて、全国で11のゾーンと、42のプロトタイプサイトを選定している。それらの分布は資料1に図示した通りである。

以上により選定されたIPCSのサイトの一日当たりの氷の必要量、即ち製氷施設の日産能力は年次別に次の通りである。

年次	総日産能力	単位：トン	
		Zone System	Proto-Type System
1983	1,673 (100.0)	1,484 (88.7)	189 (11.3)
1990	3,213 (100.0)	2,927 (91.0)	286 (9.0)
2000	4,340 (100.0)	3,988 (91.9)	352 (8.1)

これらの推定値はすべて比国政府の公表した最近の人口、GNP、漁業センサス、漁業生産量等の数値と、それらの将来に対する予測値をベースとして求められたものである。但し、これらの数値の中で最も懸念されるのは現在の生産量統計の信頼度とそれに基づいた生産予測値である。Municipal Fishery の生産量統計は1977年から標本実測調査が導入されているが、現場の標本実測調査が調査で規定されたように行われているか否かについては確証が得られていない。Commercial Fishery の生産統計は経営者からの毎月のCatch Report で報告された漁獲量に基いて推定されているが、特に大規模経営者 (Payao を使用する巾着漁業者) の報告書回収率が良くないといわれる。Fish Pond の生産量は各県からの報告によるもので特に調査方法の規定がなく、その上魚種別の分類がされていない。最近の ICLARM News Letter (Number 5/84) では、Payao による巾着網漁業の鰹、鮪の魚体の大きさが小さくなったためにこれらの魚の輸出量が減少していることから、これら海洋性の浮き魚の資源が乱獲状態になりつつあるのではないかと警告している。従って、今回のJICAから比国政府に対する最終報告書では「現在公表されている漁業生産量が正しいと仮定して」という条件を明確に付けておく必要がある。

以上の進行状況から、調査団に残された仕事は(1)上記のサイトにIPCSを建設した場合の建設コストの推定と、(2)このIPCS Networkの建設が完了した場合の運営方法であり、これらの作業は調査団が日本に帰国後12月末までに行われることになっている。

5.2 Bayawan 漁業協同組合の視察

この漁業協同組合はカナダのCIDAの資金によりNegros Oriental 県のBayawan およびDumagueteに建設された製氷施設を中心にして比国水産局の指導で1983年に設

立された。本チームはこの組合を視察した結果Nationwide IPCS Network Systemの運営方法を勧告するに当たって極めて多くの有益な情報を得ることが出来た。その詳細は資料2に記述したが、これを要約すると次の通りである。

- (1) この組合は零細漁業者（Municipal Fishermen）のために組織されたものであるが、組合員数は現在150名、組織率75%となっている。残りの25%の漁業者が組合に加入していない主な理由は魚商人に借金があるためとされている。
- (2) 組合は現在組合員から漁獲物を買上げて、組合の保冷車でDumagueteに輸送し組合のリスクにおいて販売している。もしこの方法の代わりに委託販売方式を採用して組合がすべての地元魚商人を組合の開催するセリに参加させることにすれば、組合のリスクも避けられ、また組合はこの方法により漁業者の借金を代位弁済することが可能となるのですべての漁業者が組合員になると考えられた。
- (3) 現在、組合は1kg当たり25Pesoと市中の製氷会社より5Peso安く氷を組合員に販売している。ところが、巾着網漁業者および魚商人は組合員になることが出来ないために製氷所のある漁業協同組合の前を素通りしている。もし、資本漁業である巾着漁業者および魚商人を漁業協同組合の准組合員にして彼等にも氷を売れば組合の事業成績が向上すると考えられる。現在、日産2.5トンの製氷能力があるのに生産された氷の半分ぐらいしか売れていない。
- (4) Bayawan 漁港は1980年に建設されBayawan 川に沿う水揚げ岸壁とそれに隣接した漁港用地から形成されている。その漁港用地の一部を利用して二階建のコンクリート製ビルディングが建設され、その中に漁業協同組合の事務所と製氷施設が収容されている。ところが、安全確保のためこのビルディングの敷地だけを囲んだ厳重なフェンスが設けられているために、漁業協同組合の施設は水揚げ岸壁と孤立している。水揚げ岸壁は政府（多分、公共事業省）の予算で、漁業協同組合の施設はCIDAの資金によって建設されたためにこのようなことが発生したと思われる。水揚げ施設と製氷施設は一体として機能すべきものであるから、同一の漁業協同組合の管轄下に置くべきものであるが、現在水揚げ岸壁を管理する母体は存在しない。

5.3 合同作業監理委員会

最初に草野現地調査団長より第二段階調査の調査結果について詳細な報告がなされたが、それについて特に本質的なコメントはなかった。第二段階調査の調査が開始された直後に水産局（BFAR）とPFDAが共に天然資源省から農業食糧省に移管されたために今回の漁業用に立案したIPCS Network Systemの中で一部の野菜、肉類の産地についてそれらを利用できるように容量を拡張出来ないかとの提案があり、草野調査団長よりデータ

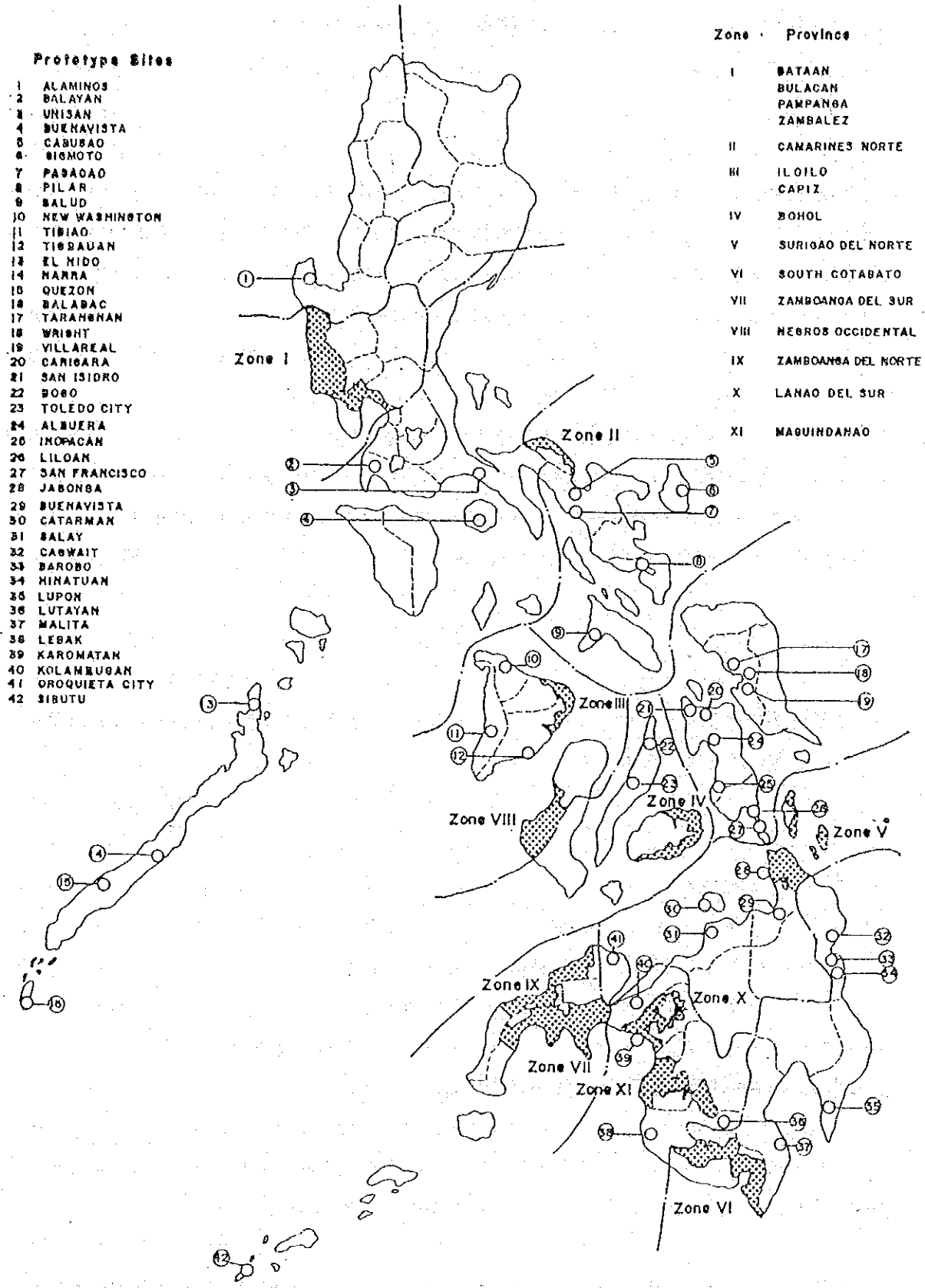
を提供してもらえば可能な旨解答した。

この会議で特に比国側が強調したことは現在のプロジェクトの拡張の形で水産物輸送システム（FTS）の立案作業を引き続き実施してもらいたいと言うことであったが、これは外交ルートを通じ新たにプロポーザルを提出してもらうことで了解が得られた。

PFDAのSarmiento氏よりNationwide IPGS Network Systemの運営方法について私案が述べられ、当方の意見を求められた。これに対して山本より、目下公共事業省（MPWH）の建設中の沿岸小漁港（Municipal Fishing Port）も、PFDAがこれから建設しようとしている全国IPGSシステムも沿岸小漁民にひ益することを目的としているので、これらの漁業インフラが沿岸漁業者が漁業協同組合を組織する動機を与えるようになることが望ましいことが述べられた。ただし、現況では一挙に漁業協同組合をつくることは困難であるので、真の漁業協同組合が出来るまでの間に何らかの中間的組合を組織し、その組合には資金を持っている地元の魚商人（Local Fish Dealers）や商業規模漁業（Commercial Fishery）の経営者を准組合員として参加させることを考えてはどうかというアイデアを提出しておいた。この考え方は今回本チームがBayawan漁業協同組合を視察する機会を得たことから生まれたものである。

なお、この会議の詳細については資料3（双方で取り交わしたMinutes）を参照されたい。

資料 1 ゾーン及びプロトタイプサイトの分布



資料2 Bayawan 漁業協同組合の視察（詳細）

Bayawan 漁業協同組合現地視察報告

1. 前 書 き

零細漁業のための製氷冷蔵施設全国ネットワークシステムの基本計画づくりに関する要請がフィリピン政府から日本政府へなされ、これに対応し、国際協力事業団（JICA）は約6か月にわたりフィリピンへ調査団を派遣した。調査期間は1983年11月24日から1984年3月22日の第一段階調査と、1984年6月25日から10月7日までの第二段階調査に分けられた。調査団は現在までに建設すべき製氷冷蔵施設の位置及び製氷能力についての基本計画の作成を完成した。

フィリピン政府要請では施設建設後製氷冷蔵施設全国ネットワークシステムを効果的に運営する方法の勧告も求められている。そこで、この件に関する参考資料を得るため、FAOの南シナ海漁業開発調整計画にそいCIDAの資金により同様な製氷冷蔵施設が建設され、漁業協同組合による運営が行われているNegros Oriental 県のBayawan を訪問した。

2. 視察の目的

全国製氷冷蔵施設ネットワークシステム運営計画の参考とするため、Bayawan 漁業協同組合の現在の運営状況を調査する。

3. 期 間

1984年9月27日～28日

4. Bayawan 漁業協同組合運営の現況

時間が限られていたこと及び2人の総責任者が日本へ出かけ不在であったことから必ずしも十分なものではなかったが、少なくとも次の知見が得られた。

(1) 幾つかの漁協事業が開始されているが、Bayawan 漁業協同組合はごく初期の段階にと

どまっている。現在協同組合は6人の顧問の指導下におかれているが、このうち5人は水産局から派遣された職員であり、残りの1人は農業食糧省協同組合局の職員である。従って、これらの顧問には政府により給料が支払われている。協同組合には約10人の自前の職員、事務員、運転手、警備員がいるが、彼らの給料もまた政府（実際にはOIDA援助資金）により支払われている。

(2) 零細漁民（使用する漁船の大きさが3トン未満）のみが協同組合の組合員となる資格を有する。現在Bayawanにおける協同組合への加入人数は約150人で、この地域の全漁民の約75%に当たる。残りの25%の漁民が協同組合に加入できない理由は、漁獲物の買手である仲買人に対し、いまだ借金があるからである。

(3) 日産2.5トンのフレークアイスを作ることができる2つの製氷施設が完成している。1つは漁業生産地であるBayawanにあり、他の1つはNegros Oriental県の県都で主要水産物消費地であるDumagueteにある。

この2つの施設は2ヶ月前から稼動を開始した。しかしながら作られた全ての氷を販売するまでに致っていない。Bayawanの氷の売上記録によると一日に売却された氷の最大量は1.5トンであり、一日に売却される量は平均して製氷施設の日産能力の約半分程度である。協同組合により売られている氷の価格は、組合員に対しては25ペソ/kg、非組合員に対しては30ペソ/kgである。ちなみに、Bayawan市内にある既存の私設製氷会社の氷の販売価格は30ペソ/kgである。

(4) Bayawan川の左岸に沿って、政府資金により作られた階段式水揚岸壁が約100メートルにわたっており、零細漁船、商業漁船の区別なく自由に使われている。しかしながら岸壁の管理責任を持つ組織はない。言い換えれば、Bayawan漁業協同組合はこの水揚岸壁について何らの責任を持っていない。（付図参照）

(5) 協同組合は組合員の漁獲物を買上げ、CIDAにより供与された保冷車でDumagueteに運び、自己の危険負担により売却している。これらの魚は氷により冷却されているのでDumagueteにおける売価は、氷蔵されないものよりも約20%高いと言われている。

(6) 製氷施設、貯氷庫、冷却室、控室、協同組合の事務室が入った新しい2階建のコンクリートの建物が完成している。しかしながら漁港のための十分な背後地が確保されているにもかかわらず、上記の建物のある場所だけがフェンスで囲まれ、水揚岸壁から完全に独立したものとなっている。このため商業規模漁業者（3トン以上の漁船を使用する漁業者で組合員となっていない）の漁獲物は、上記施設を使用することなく素通りしている。

5. 協同組合関係者との話し合い

調査団は Bayawan 漁協の今後の運営改善について協同組合関係者との間で以下のような意見交換を行った。

(1) 協同組合の会員資格

Bayawan 漁業協同組合は零細漁民の利益のために設立されたものであるが、製氷施設を十分に活用するため商業規模漁業の経営者を准組合員として加入させることができよう。そうすれば、協同組合の収入増がもたらされるだろう。

(2) 漁獲物の競売（委託販売方式）による販売

Bayawan 漁業協同組合が、零細漁業、商業規模漁業の如何を問わずそれらの漁獲物の委託販売をすることとし、漁協の開設する競売を通して魚商人に販売するようにすれば魚価の公正さがよく保たれるだろう。また、この方法は組合員に代わって漁獲物販売を行っている現在の方法のような危険負担がなくなるばかりでなく、漁協の安定した収入増をもたらすであろう。

更に、上記委託方式をとれば、組合が売上高の中から組合員の借金を支払うことができるので、現在借金があるため組合に入れない漁民の組合への参加が促進されるだろう。

(3) 零細漁業への漁業権の適用

この考えは既に1983年にFAOの堀田氏がBayawanを訪れた際同氏により提案がなされている。漁業権を漁業協同組合に与えれば沿岸の漁業資源の管理と保全の上から零細漁民にとって最も好ましいものとなるであろう。同時に漁業権制度は零細漁業と商業規模漁業の間の紛争を減少させるであろう。

(4) Bayawanにおける全ての漁業インフラ施設の集約化

水揚岸壁も製氷冷蔵施設も共に漁業のために作られたものであり、どちらが欠けても十分に機能しえないものであるから同一管理者、すなわち、Bayawan 漁業協同組合の手で管理されるのが最も適切であろう。この場合、フェンスはBayawan 漁港地域全体をカバーするように作り直す必要があるだろう。

以上の考えは協同組合関係者により好意的に受け入れられた。協同組合の専門家である Gantalaog 氏は、競売方式の導入により水産物流通業者に借金を負っている漁民を組合に参加させることができるという点に大きな関心を示した。市場流通の専門家である Guerrello 氏は

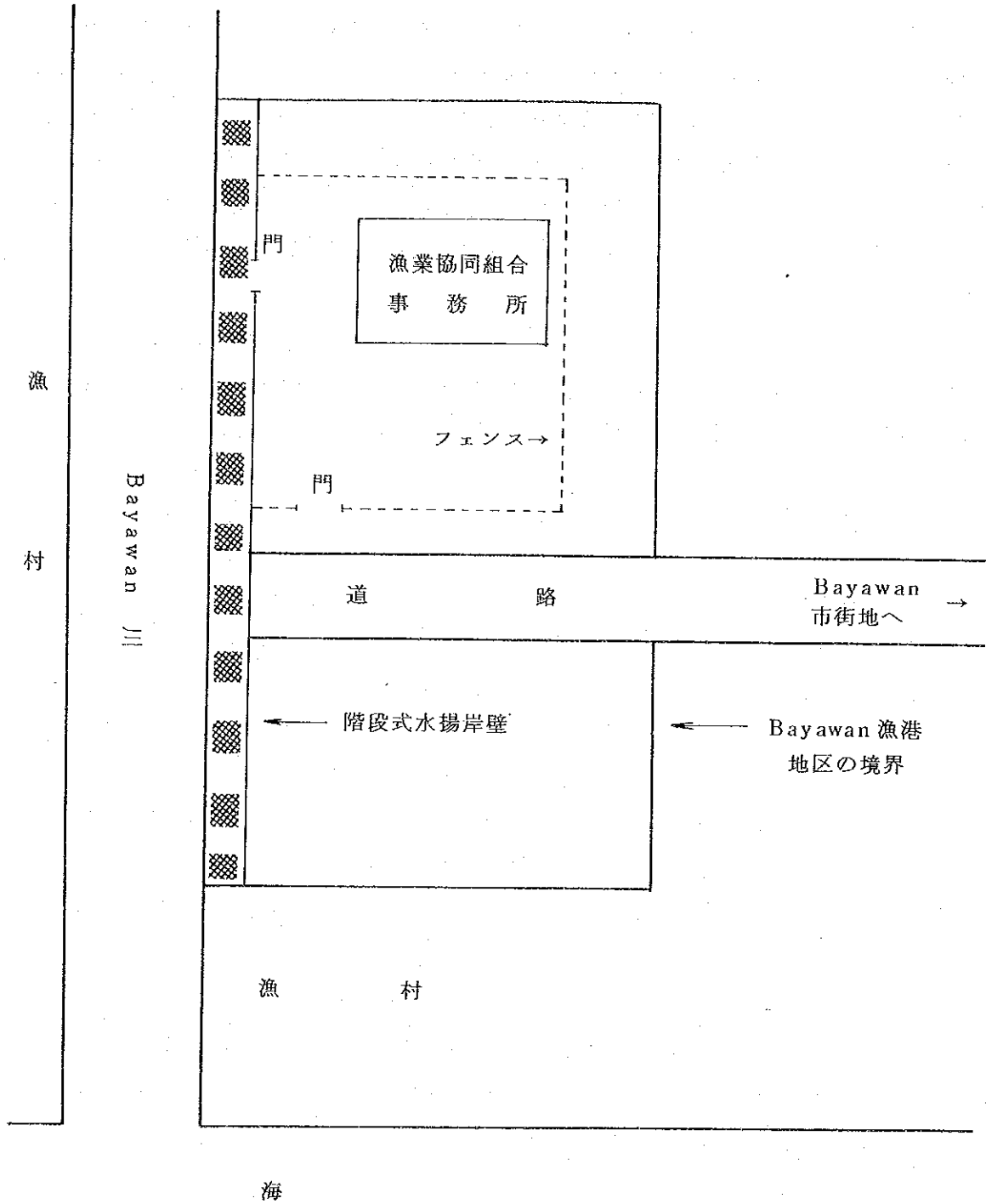
既に堀田氏から話を聞いていたこともあり零細漁業における漁業権の必要性について主張しこの分野におけるFAOの指導援助を期待していた。

Manilaへ帰った後、山本はFAOの南シナ海漁業開発調整計画の漁業計画担当者であるAurora B. Reyes氏に会い、BayawanとDumagueteにおいて討論した上記内容について知らせた。氏は全ての漁業基盤の管理を同一管理者の下に集約化することについて特に興味を持った。また、漁業権に関する新しいFAOのプロジェクトをつくることについても賛意を表し、そのプロジェクトには法律家が必要である旨強調した。この点について山本はフィリピンに対する漁業権の試験的な適用を行う初期の段階においては法律家は必要とされないだろうと述べた。

フィリピンにおいては零細漁業は市町村レベルに設立された地方政府(Municipal government)の監督下に置かれている。零細漁業に漁業権を適用するにあたっての主要な問題点は市町村長と市町村会議がこの種の新しい制度を受入れる用意があるかどうかにかかっている。

付 図

Bayawan 漁港地区の概略



OF
MEETING OF THE JOINT ADVISORY COMMITTEES FOR
THE NATIONWIDE IPCS NETWORK SYSTEM

In concluding the Phase II Study, a Joint Advisory Committee Meeting was held on October 2, 1984 at the office of PFDA with the participation of officials as listed in Appendix 1. In the meeting, the following were discussed:

1. Summary Account of the Study Progress

Study progress of Phase I and II were discussed in accordance with the following order and fully agreed upon by the joint meeting of Advisory Committees of PFDA/JICA.

(1) Area covered: 101 proposed sites by PFDA and some 20 additional sites recommended by the Study Team.

(2) Major purpose of M/P:

- a. Selection of priority sites
- b. Identification of plant capacity
- c. Formulation of IPCS network system
- d. Recommendation of management concept

Of the above four works, those relating to a. and b. have been completed. Those for c. and d., however, will be finalized by April, 1985.

(3) Policy based upon:

- a. Preliminary Revised Five-Year Development Plan, August, 1984, NEDA
- b. Revised Data of IFDP, July, 1984, FIDC

(4) Data provided mainly by GOP and supplemented during the course of Field Survey I/II.

(5) System: Zone system and proto-type system

(6) Facilities:

Zone System

- a) Basic facilities: Ice plant, cold storage, ice storage, generator, mobile ice plant if required and the building for the said facilities.

- b) Supporting facilities: Ice transport vehicles, spare parts for basic facilities, warehouse for the spare parts, workshop and equipments for repairing of machine, management office, lodging house and communication equipment.
- c) Infrastructure: Land reclamation/consolidation, tube-well and other water supply facilities, parking area and access road.

Proto-type System

Proto-type system is composed of only basic facilities without supporting facilities and infrastructure, which should be provided by the other projects.

Note: A national centre which will be responsible for the training of mechanical engineers and mechanics and also continuous supply of spare parts will be established.

(7) Relationship of the recommended IPCS system with existing IPCS

a) Existing IPCSs under PFDA

The IPCSs, which were taken over from BFAR will be considered as parts of the recommended IPCS system when the IPCSs are located within the area of zone system.

b) Existing/planned IPCS under other National Projects

The area, which will be covered by the other National Projects under operation or planning, will be excluded from the recommendable sites by the Study.

However, IPCS to be constructed for the satellite ports of RFPP II are considered to be parts of the recommended IPCS system, if the sites are identified to be indispensable to complete the zonal system.

(8) Requirement of Cold Storage

The Study Team identified that owing to the seasonality of fishery, the surplus of fish production against the demand may occur in some regions. It was, however, unable to justify the necessity of cold storage due to the absence of frozen fish distribution system and for unknown factors particularly regarding the preference of frozen fish by consumers.

(9) Preparation of the Report

A. Timing

- (1) Draft Final Report to be prepared by the end of December, 1984 to the latest. Then JICA will dispatch the members of the Advisory Committee and the Study Team for the briefing of Draft Final Report and the comments of GOP.
- (2) Final Report to be completed and submitted to the GOP by the end of April, 1985.

B. Construction for the recommended IPCS system

The report will give to the best knowledge of the Study Team the cost for the construction of the recommended IPCS system. However, the cost may not be very accurate, as the Study Team was unable to visit all possible sites owing to the limited time available.

C. Pilot Testing

The report also will indicate a pilot testing with respect to the management of IPCS system which will be implemented both at the selected zone and proto-type site in the initial stage of the construction of the Nationwide IPCS System.

2. Requirement of Additional Data

In order to finalize the Draft Final Report, additional data as listed in the Appendix 2 are required and are to be forwarded by PFDA to the Study Team by not later than the 20th of October, 1984.

3. Further Comments

- (1) On the use of the IPCS by other agricultural products

Atty. Marcos and Atty. Sarmiento asked the Study Team whether the IPCS study also considered the agricultural products, aside from fish, in determining the capacities. Mr. Kusano answered that in deciding the capacity of IPCS for every zone and site, national average of 20% of the ice plant capacity has been set aside for the products other than fishery. However, he said that if additional information is received, additional capacities of the ice plant may be considered for some area.

(2) On Management of IPCS

Atty. Sarmiento enumerated possible alternatives to the management of the IPCS plants, as follows:

- a. Sole management by PFDA;
- b. Joint management by PFDA and the private sector;
- c. Lease to private sector; and
- d. PFDA as conduit to private sector similar to arrangement made by the Local Water Utilities Administration for the construction and management of water districts.

Dr. Yamamoto said that ideally, the IPCS should be managed by a fishery cooperative. Pending the formation of a fishery cooperative, an intermediate set-up must be organized. This intermediate set-up must include the small-scale fishermen as full members. Fish buyers and big-time boat operators may be invited as quasi members who are not eligible for voting. Those buyers and operators could provide the necessary capital during the early formative years.

(3) Renewed Project including Fish Transport System Project

The PFDA Advisory Committee reiterated the request to expand the coverage of the IPCS project to include a fish transport system and Asst. Sec. Marcos stated that Minister Escudero has written a letter to Japanese Embassy regarding this matter. It was explained by Dr. Yamamoto and Mr. Morikawa that PFDA should send thru Diplomatic Channel and NEDA a new proposal to GOJ for the fish transport system and also this must be put in top priority by NEDA.

Appendix 1

JOINT MEETING OF ADVISORY COMMITTEES

Date : October 2, 1984

Place : PFDA Conference Room

Attendance:

1. PFDA Advisory Committee
 - Atty. Aurora B. Marcos - MAF, Asst. Secretary
 - Atty. Malcolm I. Sarmiento - PFDA, Officer-in-Charge
 - Mr. Rodolfo Madrid - MAF (For Dir. Alix)
 - Ms. Cecilia Reyes - BFAR (For Dir. Felix R. Gonzales)
 - Mr. Manuel S.J. de Leon - NEDA, Asst. Director,
Agriculture Staff
2. JICA Advisory Committee
 - Dr. Tadashi Yamamoto
 - Mr. Tohru Morikawa
3. JICA Study Team
 - Mr. Tateo Kusano
 - Dr. Tamotsu Tomiyama
 - Mr. Takashi Inoue
 - Mr. Teruo Yabana
 - Dr. Kyoichi Sugiyama
 - Mr. Masanori Doi
4. PFDA Counterpart
 - Mr. Facundo R. Yeneza, Jr.
 - Mr. Nelson M. Davila
5. NEDA Alternate Representative
 - Mr. Aristeo Portugal
6. JICA Representative - Mr. Tomomasa Kageyama
7. JICA Study Team Staff - Ms. Ruth L. Sarmiento

Appendix 2

1. Data on Hagonoy Fishing Port

1.1 Data Source

Bureau of Design, MPWH

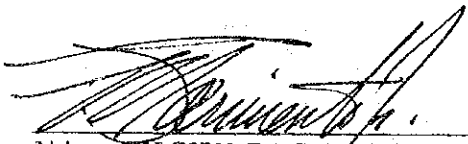
1.2 Data

- (1) Drawing of Layout Plan
- (2) Floor Plan and the section of the following buildings and facilities
 - a. Ice Plant and Refrigeration Building
 - b. Administration Building
 - c. Water Reservoir
 - d. Pump House
 - e. Elevated Water Tank
 - f. Powerhouse
 - g. Gas Station
- (3) Function/Capacity of the following facilities
 - a. Ice Plant and Refrigeration
 - Ice making capacity and type of ice
 - Cold Storage capacity
 - Ice Storage capacity
 - Floor level from the ground line for ice making room, cold storage, ice storage and platform
 - b. Administration Building
 - Name and floor area of each room
 - c. Water Reservoir
 - Capacity
 - What is the source of water, deepwell and/or waterworks system
 - Available volume of water for IPCS
 - Water quality
 - d. Pumphouse
 - depth of deepwell
 - capacity of pump
 - waterhead of pump
 - horsepower of pump
 - e. Elevated Water Tank
 - capacity
 - height from ground line to water level in tank

- f. Powerhouse
 - capacity of substation
 - available capacity of electric power for IPCS
 - g. Gas Station Volume
 - (4) Breakdown of cost estimates as of January 1983
 - (5) Program of Works
 - (6) Soil data resulted from Boring Test
- 2. Data on Iloilo Regional Fishing Port
 - 2.1 Data Source
 - PMO-FPP I, MPWH
 - 2.2 Data
 - (1) Floor Plan of IPCS
 - (2) Construction and breakdown for building and equipment of IPCS
- 3. Map
 - 3.1 Source of Data
 - (1) Himamaylan, Negros Occ.
 - (2) Ponot, Zamboanga del Norte
 - (3) Marawi City, Lanao del Sur
 - (4) Datu Piang, Maguindanao
 - (5) Pagadian City, Zamboanga del Sur
 - (6) Surigao City, Surigao del Norte
 - (7) Ubay, Bohol
 - (8) Sta. Elena, Camarines Norte
 - 3.2 Data
 - (1) Vicinity map of the proposed site
 - (2) Area development plan
 - (3) Existing land use
- 4. Philippine Economic Indicators, Sept., 1984, NEDA
- 5. Organization, management and financial system on National Fisheries Development Project funded by IBRD and functions in each section
- 6. Organization chart of MAF and specific function in each section
- 7. Basic policy implemented on the encouragement of fishermen's cooperatives
- 8. Organization and management system of Iloilo fishing port and function in each section
- 9. Organization, management and financial system of LWUA waterwork project funded by IBRD

APPROVED BY:

Philippine Side:



Atty. MALCOLM I. SARMIENTO, JR.
Assistant General Manager
Philippine Fisheries
Development Authority

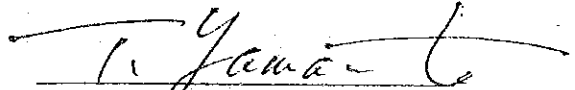
Japanese Side:



Mr. TATEO KUSANO
Team Leader
JICA IPCS Study Team



Atty. AURORA B. MARCOS
Assistant Secretary
Ministry of Agriculture
and Food



Dr. TADASHI YAMAMOTO
Chairman
JICA Advisory Committee

全国製氷冷蔵施設ネットワークシステムのための 合同作業監理委員会議事録（和文仮訳）

第2段階調査を終えるに当たり、1984年10月2日、PFDAの事務所において、合同作業監理委員会が付表1に掲げられたような参加者の下で行われた。会議においては次のような事柄が議論された。

1. 調査の進行状況の概略説明

第1段階調査及び第2段階調査の進行状況について、次の順序に従って議論され、漁業開発公社（PFDA）及び国際協力事業団の作業監理委員会合同会議は完全な意見の一致をみた。

(1) 対象地域：PFDAにより提案された101サイト及び調査団により推薦された約20ヶ所の追加サイト

(2) 基本計画の主な目的

- a 優先サイトの選択
- b 施設容量の確認
- c 製氷冷蔵施設ネットワークシステムの説明
- d 運営概念の提示

上記4つの作業の中でaとbに関するものは終了した。cとdの作業は1985年4月までに終了する。

(3) 基本方針

- a 1984年8月に経済開発局（NEDA）により作成された5ヶ年開発計画修正案
- b 1984年7月に水産業振興審議会により作成された水産総合開発計画修正データ

(4) 主としてフィリピン政府により提供されたデータ及び現地調査I/IIの中で補われたデータ

(5) システム：ゾーンシステム及びプロトタイプシステム

(6) 施設

ゾーンシステム

- a) 基本施設：製氷施設、冷蔵施設、貯氷施設、発電機、必要があれば自動車に乗せた製氷冷蔵施設及び上記施設の建物
- b) 支持施設：氷輸送車、基本施設のスペアパーツ、スペアパーツの倉庫、機械修理の作業場とその設備、管理事務所、宿泊所、通信設備
- c) インフラ：埋立／整理、管井戸及び他の水供給施設、駐車場及び近接道路

プロトタイプシステム

プロトタイプシステムは支持施設やインフラを含まず、基本施設のみで構成されている。支持施設等は他のプロジェクトにより与えられるべきである。

注：機械技師、機械工の訓練をするるとともに途切れることなくスペアパーツを供給していく役割を持つ全国規模のセンターが設立されるであろう。

(7) 推薦された製氷冷蔵施設のシステムと既存施設との関係

a) PFDAの下にある既存の製氷冷蔵施設

水産局（BFAR）から譲り受けた製氷冷蔵施設はゾーンシステムの区域の内側にある場合は、推薦された製氷冷蔵施設のシステムの一部として考えられる。

b) 他の国家プロジェクトの下にある既存のあるいは計画中の製氷冷蔵施設

現在存在するまたは計画中の他の国家プロジェクトにより包含される地域は、本調査の推薦サイトからははずしてある。

しかしながら、地方漁港複合体Ⅱの衛星漁港のために建設されることになっている製氷冷蔵施設については、ゾーンシステムを完成させるために不可欠であると見なされる場合には、推薦する製氷冷蔵施設システムの一部分に含めて考えている。

(8) 冷蔵施設の必要性

漁業の季節性のために、漁業生産が需要を上回る地方がいくつかあることを調査団は確認した。しかしながら、冷凍魚の流通システムがないこと、未知の要因がある、特に消費者の冷凍魚に対する嗜好性に未知の要因があることから余剰があるからといって冷蔵庫が必要であるということにはならない。

(9) 報告書の準備

A タイミング

- (1) 最終報告書案は遅くとも12月末までに用意される。その後、国際協力事業団は、最終報告書案の概要説明とフィリピン政府の意見聴取のために、作業監理委員会と調査団の構成員を派遣するであろう。
- (2) 最終報告書は1985年4月末までに完成されフィリピン政府に提出される。

B 推薦する製氷冷蔵施設のシステムの建設

報告書には推薦する製氷冷蔵施設のシステムの建設費用について調査団の知り得た範囲内で記されている。しかしながら、時間が限られていたことから調査団は全てのサイトを訪れることはできなかつたので、費用はそれほど精密なものではない。

C パイロットテスト

報告書には全国規模で製氷冷蔵施設のシステムを建設していく初期の段階において、選択されたゾーンとプロトタイプの両方で行われるであろうシステム運営に関するパイロットテストについても触れる。

2. 追加データの要望

最終報告書案を仕上げるためには付表2に掲げられた追加データが必要であり、それらはPFDAから調査団へ1984年10月20日以前に発送されなくてはならない。

3. 追加意見

(1) 他の農産物による製氷冷蔵施設の使用について

Marcos氏とSarmiento氏は、調査団に対して、容量を決める際、水産物の他農産物についても考慮しているかどうかを尋ねた。草野氏は、製氷冷蔵施設のゾーン毎サイト毎の容量を決める際、製氷施設においては、水産以外の生産物のために全国平均に相当する20%を取ってであると答えた。しかしながら、追加の情報が得られれば、製氷施設の容量の追加について、いくつかの地域では考慮すると草野氏は言った。

(2) 製氷冷蔵施設の運営について

Sarmiento氏は製氷冷蔵施設運営上考える代替案を次のように列挙した。

- a PFDAによる単独運営
- b PFDAと私企業との共同による運営
- c 私企業への貸与
- d 水管区における建設と運営において、地方給水事業公社により行われている方法と同様なやり方でPFDAが私企業の先導を果たすこと。

山本博士は理想的には製氷冷蔵施設は漁業協同組合により運営されるべきであると述べた。漁業協同組合が形成されるまでの間中間的な組織がつくられなくてはならない。この中間組織は零細漁業者を正会員として含むものでなくてはならない。魚商人と大規模漁船の経営者は投票の資格のない準会員として招かれるだろう。それらの商人と経営者は初期の形成期に必要な資本を供給することができる。

(3) 水産物輸送システムプロジェクトを含む新しいプロジェクト

PFDAの作業監理委員会は水産物輸送を含めるため、製氷冷蔵施設プロジェクトの対象範囲の拡大を要請した。また、Marcos次官はEscudero大臣がこの問題に関し日本大使館へ書簡を出した旨を述べた。山本博士と森川氏は水産物輸送システムについてはPFDAは外交ルート及び経済開発局を通じて日本政府に対し新しい提案を出すべきであり、この提案は経済開発局により最優先の順位がつけられなくてはならないと説明した。

付表 1

作業管理委員会合同会議

日 時：1984年10月2日

場 所：PFDA会議室

参 加 者

1. PFDA作業監理委員会

Aurora B. Marcos	農業食糧省次官
Malcolm I. Sarmiento	PFDA
Rodolfo Madrid	農業食糧省 (Alix局長の代理)
Cecilia Reyes	水産局 (Felix R. Gonzales局長の代理)
Manuel S. J. de Leon	経済開発局次長、農業担当

2. 国際協力事業団作業監理委員会

山 本 忠
森 川 貫

3. 国際協力事業団調査団

草 野 千 夫
富 山 保
井 上 孝
矢 花 昭 男
杉 山 恭 一
土 居 正 典

4. PFDAカウンターパート

Facundo R. Yeneza, Jr
Nelson M. Davila

5. 経済開発局代表代理

Aristeo Portugal

6. 国際協力事業団代表

影山 智 将

7. 国際協力事業団調査団スタッフ

Ruth L. Sarmiento

付表 2

1. ハゴノイ漁港に関するデータ

1.1 データ源

公共事業省計画局

1.2 データ

(1) 配置計画図

(2) 以下の建物及び施設の平面図と断面図

- a 製氷施設及び冷蔵施設
- b 管理棟
- c 貯水池
- d ポンプ屋
- e 高架貯水槽
- f 発電所
- g ガソリンスタンド

(3) 以下の施設の機能／容量

- a 製氷施設と冷蔵
 - ・製氷容量と氷の型式
 - ・冷蔵庫の容量
 - ・貯氷庫の容量
 - ・製氷室、冷蔵庫、貯氷庫、踊り場の基線からの床面高さ
- b 管理棟
 - ・各部屋の名前と床面積
- c 貯水池
 - ・容量
 - ・水源は何か、深井戸か水道システムか
 - ・製氷冷蔵施設のために利用できる水容積
 - ・水質
- d ポンプ屋
 - ・深井戸の深さ
 - ・ポンプ容量
 - ・ポンプの水頭
 - ・ポンプの馬力

- e 高架水槽
 - ・容量
 - ・基線から水槽内水位までの高さ
- f 発電所
 - ・変電所の容量
 - ・製氷冷蔵施設のために使用可能な電力容量
- g ガソリンスタンドの容量

(4) 1983年1月現在の費用見積りの内訳

(5) 土木工事の計画

(6) ボーリング試験から得られた土質データ

2. イロイロ地方漁港に関するデータ

2.1 データ源

公共事業省漁港複合体Iプロジェクト推進室

2.2 データ

(1) 製氷冷蔵施設の建物、設備の構造と内訳

3. 地図

3.1 データ源

- (1) Himamaylan, Negros Occ.
- (2) Ponot, Zamboanga del Norte
- (3) Marawi City, Lanao del Sur
- (4) Datu Piang, Maguindanao
- (5) Pagadian City, Zamboanga del Sur
- (6) Surigao City, Surigao del Norte
- (7) Ubay, Bohol
- (8) Sta. Elena, Camarines Norte

3.2 データ

- (1) 提案されたサイトの周辺図
- (2) 地域開発計画
- (3) 既存の土地利用

4. フィリピンの経済指標、1984年9月、経済開発局

5. 国際復興開発銀行資金援助による全国水産開発プロジェクトの組織、運営、財政制度及び各部局の機能

6. 農業食糧省の組織図と各部局の具体的な機能

7. 漁業協同組合の奨励に関し行われている基本方針

8. イロイロ漁港の組織・運営制度と各部局の機能

9. 国際復興銀行資金援助による地方給水事業公社の組織、運営、財政制度

以下により同意された：

フィリピン側：

日本側：

MALCOLM I. SARMIENTO

フィリピン漁業開発公社次長

草野 干 夫

国際協力事業団製氷冷蔵施設調査団団長

AURORA B. MARCOS

農業食糧省次官補

山 本 忠

国際協力事業団作業監理委員会委員長

資料 4 合同作業管理委員会提出資料（調査の進捗状況に関する報告）

Republic of the Philippines

The Study of Master Plan for the Nationwide
Ice Plants and Cold Storages Network System

On the Progress of the
Study for Joint Committee
of FEDA/JICA

Phase II Study

October 1984

Japan International Cooperation Agency

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 - 4. Selection of Priority Zone
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 - 6. Selection of Proto-type Site
 - 7. Requirement of IPCS by Zone/Proto-type
 - 8. Identification of Ice Type

I. INTRODUCTION

The present fish marketing system in the Philippines can be described as dispersed, inefficient and uncoordinated. Basic problems of the fish marketing sector are: (1) the lack of supportive market facilities, such as ice plant and cold storage (IPCS) facilities, necessary for the efficient distribution of fish from surplus to deficit areas, (2) the lack of fishing ports, markets, and feeder roads, (3) the limited application of post-harvest technology, (4) the extended marketing chain resulting in unstable and high fish prices, and (5) inadequate benchmark information.

The Preliminary Study of IPCS was implemented to resolve such problems closely related to the MFPDP and the FTS by PFDA.

The GOP has requested the GOJ to review the outcomes of the said Preliminary Study and to assess the existing IPCS to formulate the Master Plan for the Nationwide IPCS Network System. In response to the request, the GOJ dispatched the Study Team to the Philippines according to the I/A on the technical cooperation which was agreed in September 1983 between JICA and MNR/PFDA. The executive agencies involved are the JICA of Japan and the MNR/PFDA of the Philippines. The Advisory Committees at both sides have been set up for the effective proceeding of the Study.

In July, 1984, PFDA was transferred from MNR to MAF. The executive agencies changed MNR/PFDA to MAF/PFDA and a new Advisory Committee of PFDA was also set up in September 1984.

The Study for the Master Plan has been implemented through the following two Phases:

- Phase I : (1) To review the Preliminary Study by PFDA and to assess the existing IPCS System. (2) To develop the basic principles for the formulation of the Master Plan.
- Phase II : (1) To finalize the Master Plan in the form of the IPCS Network System to cover the whole country within the extent of the proposed sites by the PFDA.

The Team collected data and information in close cooperation with the MNR, MAF, PFDA, MPWH, BFAR, NEDA, DBP, other government organizations and several associations of the private sector related to the IPCS industry.

Moreover, the progress of the Phase I Study was reported to the Advisory Committee of PFDA, February 14, 1984, and to the Joint Advisory Committee of PFDA and JICA, March 7, 1984. Progress of the Phase II Study on the works done in the Philippines was also reported to the Joint Advisory Committee on October 2, 1984.

The Interim Report was submitted to GOP in April 1984, being pointed out the basic principles of the Master Plan. The Draft Final Report will be submitted by the end of 1985 and the Final Report will be completed by the end of March 1986.

II. PROGRESS OF PHASE I STUDY

1. Assessment of the Existing IPCS System

1.1 General Conditions

There exist ice plants of 15,171 tons/day and cold storages of 136,206 tons/day in the Philippines as of 1983. Out of the total number of cold storages, 76,947 tons are only for chilling of food at +5 to -5°C, and the rest, 59,259 tons are for frozen food set below -15°C.

Total rated capacity of the private sector is 14,576 tons/day corresponding to about 96% of total capacity in the Philippines, while that of the public sector is only 595 tons/day. The private sector also has 74,003 tons of cold storages for chilling of food and 58,671 tons for frozen food, which corresponds to about 96% and 99% respectively to the total capacity of the country. The former plants of the public sector are only 2,944 tonners and the latter plants only 588 tonners.

A regional gap is seen on the investment of IPCS. Majority of IPCS is located in NCR, in which the plants are 5,733 tonners cold storage of food, 61,107 tonners for chilling and 57,953 tonners for freezing of food. The share of NCR is about 38% of ice plant, about 79% of cold storage for chilling and about 98% for freezing to the total capacity of plants in the country. Cold storages are much more popular in NCR than in the other areas. About 42% of ice is sold to the fishery sector in NCR and 80% in the other areas.

The need for public IPCS is extremely great in the other areas than in Luzon, because of low incentives for investment by the private sector.

1.2 Public Sector

There exists the planned and constructed IPCS by public sector such as the plants under NFPC, RFPPI/II, NPFDC, NFDP and PFDA plants taken over from BFAR. Among them, only PFDA plants from BFAR are operational and the other plants are now under test run stage or planning.

The IPCS taken over from BFAR (BFAR IPCS) have been constructed in 35 sites under the fund arrangements by Danish Loan for 12 sites by Emergency Employment Administration (EEA) for 16 sites, by Japanese Reparations for 6 sites and BFAR Special Projects for 1 site.

10 sites are operational corresponding to about 40% of the 26 completed plants, and the other 16 under rehabilitation or non-operational as of December 1983. The other 9 sites are either under construction, test run, or commencing construction.

Major ⁰problems of BFAR IPCSs are summarized as follows:

1) Technical Aspect

a) Lack of Spare parts

Owing to the delay of construction, even after the arrival of machineries and equipment from the donating country, some spare parts were lost and some machineries became useless. Moreover, there exists a constant shortage of spare parts, because of difficulties in importing these parts and a lack of knowledge and/or the information about the presence in local shops supplying the said spare parts.

b) Shortening of Physical Life of Machineries

The physical life of plants was shortened due to the faulty method of stocking/storing machineries and the machines which have been affected can in no way be replaced by new ones, because of the lack of budget allocated for that purpose.

c) Model Change of Machineries

The compressor of the ice plant was mainly of the vertical-open type (VOT) in the earlier stage of BFAR plants construction, while the compressors granted in recent years are of the new type, namely the multi-cylinder type (MCT) and screw-compressor type (SCT). The model of machines has been changed in compressor-producing countries from VOT to MCT and SCT.

d) Low Mechanical Efficiency

Mechanical efficiency is extremely low, compared with the rated capacity.

e) Out of Stock of Vital Documents

Operation manuals and lists of spare parts were out of stock in the BFAR, due to a lack of a systematic management and filing of documents.

f) Budget for Staff Training

Training for practical techniques was not implemented continuously due to a lack of a corresponding budget. Consequently, future technical defects of new models will be usually traced to poor operating and maintenance techniques.

g) Water and Energy Problems

Water Supply

The major sources of water are the existing waterworks system and deep well. Problems in water supply are as follows:

- a) Frequent water supply failure
- b) Low water pressure
- c) Regular water suspension
- d) Salty water
- e) Lack of additional budget for the water supply system
- f) Non-inclusion in the budget for the construction of deep wells

Electricity

Except for 6 sites supplied by Electric Cooperatives and with generator, the others will face power supply problems whenever their generators or electric supply systems are out of order, since there is no other supportive generator.

Other major energy problems are the frequent brownouts and the inadequate supply of heavy fuel oil for diesel engine.

h) Land Acquisition

There are only a few sites located near a fish landing site or fish trading center. This is because BFAR was responsible only to select high priority fish collection centers for the IPCS in charge, and the land acquisition for IPCS sites was dependent on donators due to difficulty in fund arrangement.

2) Marketing Aspect

a) Oversupply of Ice

b) Type of Ice Consumed

BFAR's ice plants include 21 sites which produce flake ice, corresponding to 60% of all sites; 8 produce tube ice, which is 23% of all IPCSs; and only 6 produce block ice, corresponding to 17% of all IPCSs.

There still exist unfamiliar conditions for the use of flake ice compared with block ice. Ice type should be determined according to the technical, marketing and financial viabilities.

c) Low Demand for Cold Storage

Most of the cold storage components were not operated due to the incomplete/improper installation of wirings, pipings and insulations. Furthermore, in the case of operational storage, there are problems in operation mainly due to its high operating cost and low demand.

3) Financial Aspect

a) Break-even Analysis

The results of the break-even analysis are summarized as follows:

- The larger the operational capacity and ratio, the more profitable.
- The plants are not viable with operating capacity of less than 2 tons/day.
- The plants are not viable in extremely low operational ratio, even with a rated capacity of more than 10 tons.

b) Share by Cost Component

The energy cost of BFAR's plant averaged ₱ 153/ton of the efficient capacity of the ice plant in 1982. This corresponds to 77% of total cost which strongly influences the plants viability. The share by cost component is shown in Table 18.

4) Management Aspect

The BFAR IPCSSs are not well related to MFP since these two different projects were programmed independently. Consequently, BFAR's plants still have the possibility to meet problems in operation and management, particularly in relation to the appropriate use of the MFP.

5) Institutional Aspect*

BFAR was given the responsibility of administration, construction, and management of these IPCSSs. However, through the years, most of the BFAR IPCS have fared very poorly in terms of financial performance. BFAR, as a bureau wholly supported by the National Government, often experienced delays in the release of funds.

1.3 Private Sector

Interview Survey was conducted to the operators of the existing private IPCS and the Team also held several meetings with the APICSO members, in order to clarify the existing conditions of the private sector.

In Luzon, the APICSO is the association of dominant plant operators, while, in the other areas, private plant owners other than APICSO members operate well in relatively smaller scale, to meet the local specific conditions.

The major compressors of the APICSO are of the old type, such as VOT; hence there will be a need to change to the new MCT model, in the near future. However, the private sector will have to face the problem of funding for replacement of compressors and the expansion of the plant, at a time when private banks are charging a high interest rate of some 30% per year on loans. Private sector is discouraged from investing further, because of the effects of the economic depression.

*: It is with the hope of minimizing this problem that the Minister of Natural Resources decided to transfer the IPCS project to the PFDA in December 1982, with the rationale that PFDA, as a government corporation, would have more flexibility and freedom in handling financial matters.

1) Technical Aspect

a. Availability of Spare Parts

Some of the private firms have a capability of obtaining their spare parts in time and of manufacturing these parts in their own factories. They also have the resources to assemble the spare parts without delay.

b. Popular Type of Compressor

The major machine being used is VOT compressor. MCT is available on a second-hand basis, and operators in the private sector are still operating and maintaining their plants well in its use, even without an automatic device.

c. Operation and Maintenance

There are only a few plants to employ permanently a mechanical engineer, nor a licensed mechanic, but rather experience older personnel to save the labor cost.

2) Marketing Aspect

a. Wide Marketable Area

The private ice plant operators intend to cover a wider marketable area and establish a dominant position in their territory for scale of economy. In some areas, ice price is kept so high that it is even beyond the purchasing ability of municipal fishermen.

b. Type of Ice

Block ice is predominantly being produced in the private sector, to meet the preference of consumers.

3) Financial Aspect

The break-even price is likely to be extremely higher than the market price, in case of 1 tonner plant. One tonner ice plant seems to be not viable from the financial point of view and any plant of more than 10 tons seems to be viable under the conditions of a 50% operational ratio.

The share of energy cost is extremely high to the total cost even in private plants.

2. Review of the PFDA Preliminary Study of IPCS

2.1 Production Aspect

Fish unloadings, provided by the Preliminary Study of PFDA, was reviewed on data reliability by applying the NCSO Census and BFAR's Statistics.

There are 22 sites without data on fish unloadings, corresponding to about 20% of the original proposed sites. Data is available in the other 79 sites, where 44 sites show reliable fish unloadings.

The data provided seem to be over-estimated in the 25 sites, based on the productivity by fishermen and by fishing crafts. And the under-estimated volumes were found in the 10 proposed sites of PFDA.

2.2 Marketing Aspect

The proposed capacity by PFDA was reviewed according to the capacity by preliminary estimation in the Phase I Study.

It was found that some possible sites had a requirement of more than ten tonners ice plant which is bigger than the proposed capacity by PFDA and also no viable sites of the plant establishment.

2.3 Technical Aspect

1) Land

There are some proposed lands which have not been reclaimed, thus requiring high construction cost for necessary infrastructure development.

2) Electricity

Data on power supply was not found in the MFPDP files 1980-1983, by the PFDA, which comprise the secondary data of the Preliminary Study of IPCS. Such data should be collected through Electric Cooperative, or directly by interview to each Cooperative in Field Survey II.

Frequency of brownouts is another major constraint that influences greatly the fluctuation in the operation. Such information should be collected through the Electric Cooperative that

covers the municipality with the proposed IPCS sites, in the course of Phase II Study.

3) Water

It was found that availability of water, in quantity and quality, was the most important limiting factor for the effective operation of the plants, especially in the summer season. A shortage of water causes a critical condition in summer, because of rapid increase in water demand of both the fisheries and other sectors, at the same time.

And it was also learned through the interview with operators of private ice plants that the well-managed operated plants used their own deep wells or free-flowing water as a major source of water. Since these plants are mostly located at the inland areas, the water problem regarding quantity is eliminated, compared with those in the areas along the coast. The potential source of water should be identified based on the experiences of water availability, in the surrounding areas of the sites. Such information should be gathered through site inspection in Phase II Study.

4) Accessibility

Road conditions will be the major constraint in some sites with regard to the accessibility to MFP and the trunk road from the proposed sites.

3. Basic Principles of IPCS Network System

IPCS Network System will be formulated for the priority sites to be selected mainly from the proposed sites by PFDA. Priority sites are divided into the following two groups:

1) Zonal IPCS System (Zone System)

Several sites are integrated as the zonal IPCS network system, which will be composed of basic and supporting facilities, and infrastructure development such as:

- a) Basic facilities: Ice plant, cold storage, ice storage, ice transport vehicles, generator, mobile ice plant and the building for the said facilities.
- b) Supporting facilities: Spare parts, warehouse of spare parts, facilities and equipment for repairing of machine, training facilities for mechanical engineer and mechanics, management office and lodging house.
- c) Infrastructure: Land consolidation, tube-well and other water supply facilities, parking area and access road.

Zone center will be identified as the service center of the marketable area by zone system and the others are sub-centers.

2) Proto-type IPCS System (Proto-type system)

A proto-type IPCS will be distributed to each site of IPCS which is not covered by the zonal IPCS system, according to the lower requirement of ice.

Proto-type system is composed of only basic facilities without supporting facilities and infrastructure, which should be provided by the other projects.

The following factors are carefully considered for the formulation of the Master Plan.

1) Pilot Testing

Pilot testing should be both implemented at the selected zone and proto-type site in the initial stage of the construction of the Nationwide IPCS System.

2) Experience of the private sector will be indicative for the management system of IPCS network system to eliminate any failure of the public plants experienced in the past.

3) The Master Plan will be finalized under the condition without introduction of the new Fish Transport System (FTS).

III. PROGRESS OF PHASE II STUDY

1. Socio-Economic Framework

1.1 GDP

NEDA provided the preliminary Revised Five-Year Development Plan in August 1984, considering the present economic conditions in the Philippines.

Actual amount of GDP amounted to $\text{P}100.12 \times 10^9$ at constant prices of 1972, showing an annual growth rate of only 1.1% in 1982 and 1983. The Revised Plan shows a negative growth from 1983 to 1984, but has gradually increased up to 3.8% by the end of the Five-Year Plan period, 1987. It became 0.8% of the average annual growth rate of GDP during the Plan period.

The GOP has planned to encourage the investment of private sectors in construction and export of goods and non-factor services, while the contribution of the government sector comparatively decreases both in government consumption and construction.

GDP was projected to be $\text{P}115.8 \times 10^9$ in 1990 and $\text{P}168.4 \times 10^9$ in 2000, assuming that the average annual growth rates for 1983 to 1990 is 2.1% and 3.8% for 1990 to 2000.

1.2 Population

As contained in NEDA's Population Projection of the Philippines and its Regions, 1980-2030, population in 1990 was projected to be $61,481 \times 10^3$, $75,224 \times 10^3$ in 2000 where the annual growth rates are 2.4% for 1983-1990 and 2.0% from 1990 to 2000.

1.3 Per Capita GDP

Per capita GDP was seen as $\text{P}1,923$ in 1983 and was projected to be $\text{P}1,883$ in 1990 and $\text{P}2,239$ in 2000. A negative growth is seen from 1983 and 1990, which is -0.3% per year but a recovery is seen during 1990 and 2000 where the annual growth rate becomes 1.7%.

2. Supply and Demand of Fish

2.1 Demand of Fish

Domestic consumption was projected to be $1,582 \times 10^3$ tons in 1983, $1,937 \times 10^3$ tons in 1990 and $2,475 \times 10^3$ tons in 2000 by applying the per capita consumption in 1982 which is 30.4 kg., the real growth rate of per capita income and income elasticity of fish consumption of 0.2.

Export of fish was projected to be 57×10^3 tons in 1983, 98×10^3 in 1990 and 190×10^3 in 2000. Such projection was based on the past trend and the government promotion policy for export.

2.2 Supply of Fish

Import of fish was projected to be 29×10^3 tons in 1983, 34×10^3 tons in 1990 and 31×10^3 tons in 2000, with an annual growth rate of 2.2% during 1983 and 1990 and a negative growth of -0.7% during 1990 and 2000. The government policy stressed more on lesser imports.

Domestic supply, which is the edible portion of fish produced in the Philippines, was projected to be $1,611 \times 10^3$ tons in 1983, $2,001 \times 10^3$ in 1990 and $2,634 \times 10^3$ tons in 2000.

2.3 Fish Production by Sector

Total fish production was projected to meet both the domestic fish consumption and the trade balance.

Fish production was projected by three fisheries sectors, such as commercial/municipal fisheries and aquaculture.

In 1983, municipal fisheries dominate the highest share of fish production of 50.3% of total production or 809.6×10^3 tons. The commercial fisheries sector comes next with a production of 519.3×10^3 tons, corresponding to 32.2% of total catch, while the aquaculture sector produces 281.6×10^3 tons or 17.5% of the total production.

However, fish production is gradually being discouraged in the municipal fisheries sector during 1983 and 2000 because of overfishing to the maximum potential yield. This sector produces fish in very low growth rate of 1.8% for 1983 to 1990 and only 1.0% for 1990 to 2000. Likewise, in the traditional commercial fisheries, fish catch is not also marked to increase at a significant level during 1983 to 2000. Instead, FIDC planned to encourage more the increase of fish production in marine oceanic fisheries and aquaculture.

Fish production then for commercial fisheries was projected to be 638.4×10^3 tons in 1990 and 888.6 tons in 2000, being considered the government promotion policy on marine oceanic commercial fisheries, maximum potential yield of deep sea and actual trend of fish catch by BFAR's Statistics.

Possible maximum yield of aquaculture was assumed to be 3.0 tons/year under the semi-intensive culture method.

Thus, fish production by aquaculture sector was projected to be 447.9×10^3 tons in 1990 and 739.0×10^3 tons in 2000. It therefore shows a high annual growth rate of 6.9% for 1983 to 1990 and 5.1% for 1990 to 2000.

2.4 Fish Production by Region

Fish production is concentrated to certain Regions such as Regions VI with 361.1×10^3 tons, Region IV with 335.7×10^3 tons, Region IX with 256.5×10^3 tons and NCR with 177.4×10^3 tons in 1983.

Fish production in 2000 will be much more integrated into the advanced Regions through the development of more economical fish carrier system.

Fish production was projected to be 488.2×10^3 tons in Region IV, 466.7×10^3 ton in Region VI, 437.3×10^3 tons in Region IX, and 385.8×10^3 tons in NCR in 2000.

Commercial fisheries are concentrated in NCR with 170.2×10^3 tons catch and in Region VI with 123.9×10^3 tons in 1983. In the year 2000, fish production will be highly integrated into three Regions, namely NCR with 376.6×10^3 tons, Region IX with 155.2×10^3 tons and in Region VI with 132.8×10^3 tons production.

Municipal fisheries on the other hand are popular in Region IX with 183.5×10^3 tons, Region IV with 181.7×10^3 tons and Region VI with 136.5×10^3 tons fish production in 1983. As projected, this sector will not be able to achieve a significant growth of fish production by 2000, however, some Regions are seen to maintain their high fish production like Region IX with 248.1×10^3 tons, Region IV with 226.8×10^3 tons and Region VI with 185.7×10^3 tons in the same year.

Aquaculture sector is highly developed in Region IV where fish production is 101.2×10^3 tons in 1983. The Government emphasis on the promotion to expand fishpond areas and improve the culture method. Within the period between 1983 to 1990, advanced Regions of culturing method sector will be integrated in Regions I, III and VI. But as of this date, productivity in the said Regions are already at a higher level because of the introduction of semi-intensive method. They will still reach the maximum level of productivity because of other advanced culture method in 1990 and the rest of the Regions will achieve such target productivity by 2000. Fish productivity in this sector was projected taking into consideration the potential productivity of fishpond and the government policy.

Fish production in the year 2000 will be highly concentrated in Region IV with 208.6×10^3 tons, Region III with 169.8×10^3 tons and 148.2×10^3 tons in Region VI.

3. Requirement of Rated Capacity of Ice Plant

Ice demand for the fisheries sector in the Philippines was estimated to be 9,631 tons/day in 1983, 12,640 tons/day in 1990 and 16,529 tons/day in 2000.

Fresh fish ratio in the country was assumed to be 75.1% in 1983 and 88.0% in 2000 based upon Field Surveys I and II, Fish Distribution Study of Navotas Fishing Port and AOC in 1982, PFDA and BFAR Fisheries Statistics.

Fresh fish ratio is highly different by Region reflecting ice supply conditions in fishing/harvesting and transportation/marketing and kinds of fish.

Ice/fish ratio was estimated based upon Field Surveys I and II. Ice/fish ratio was estimated to be 0.8 for commercial fisheries, 0.5 for municipal fisheries, 0.4 for aquaculture in fishing/harvesting and to be 0.9 of inter-regional flow of fish, 0.6 of inter-municipal flow within the Region and no use of ice in the internal flow within the municipality in transportation/marketing of fish.

The ice produced in NCR is sold to the fisheries sector by 42% and in other areas by 80%. Both the operational days of the ice plants were assumed to be 300 days in a year and operational ratio to be 50% of rated capacity.

Ice supply in 1983 is almost balanced to ice demand in the country but conditions by Region are quite different because of the limit of ice distribution. Much surplus of ice is seen in the Luzon island, among which surplus is 1,380 tons/day in NCR and 1,003 tons/day in Region IV, while a shortage in Region IX by 1,321 tons/day and in Region VI 925 tons/day.

Shortage in the country will likely be increased up to 2,982 tons/day in 1990 and 6,871 tons/day in 2000 at a rated capacity. In NCR, it is almost balanced, but outside of Luzon it is likely seen that the shortage of ice will be under more critical conditions by 2000. Shortage of ice plant capacity will reach 1,739 tons/day in Region IV, 1,874 tons/day in Region VI and 2,953 tons/day in Region IX in 2000.

Shortage of ice should be satisfied or be filled in by promoting the additional investment both by public and the private sectors in the middle and the Southern part of the Philippines.

4. Selection of Priority Zone

4.1 Selection of Priority Provinces

- 1) Selection Criteria of Priority Provinces
 - a. Ice plant requirements in 2000
 - b. Number of the proposed sites by PFDA
 - c. Marketable area of ice
 - d. Presence of the National Projects of IPCS
 - e. Transportation among the proposed sites
- 2) Selected Provinces
 1. Bulacan
 2. Zambales
 3. Camarines Norte
 4. Iloilo
 5. Capiz
 6. Negros Occidental
 7. Bohol
 8. Zamboanga del Norte
 9. Zamboanga del Sur
 10. Surigao del Norte
 11. South Cotabato
 12. Lanao del Sur
 13. Maguindanao

4.2 Zoning

Priority zone was formulated by identifying the municipalities which will be covered by zone system, in the priority province and its adjacent area.

Boundary of priority zone shows the marketable area by zone system of IPCS.

The following are the major factors for the identification of zone boundaries:

a) Fish Production Factor

Municipalities in which fish projection will be more than 1,000 tons in 2000.

b) Fish Marketing Factor

- a. Municipalities to show fish surplus in 2000.
- b. Municipalities located at about 150 km. to 200 km. from possible zone center by road.

c) Physical Constraints

Zone boundaries are just up to a certain point where there are physical constraints such as mountains, rivers, sea and road accessibility.

- d) Municipalities connecting the selected municipalities' priority zone and zone boundary are shown in Fig._____.

5. Selection of Zone Center

5.1 Selection Criteria of Zone Center

Zone center was selected according to the following two-step procedure.

Step 1: From marketing conditions

- 1) Fish production in 2000
- 2) Ice shortage in 2000
- 3) Presence of existing IPCS in 1983
- 4) Fish/ice distribution center

Step 2: From infrastructural conditions

- 1) Land area and price
- 2) Land consolidation
- 3) Water supply
- 4) Power supply
- 5) Road surface conditions
- 6) Accessibility

5.2 Selected Zone Center

Zone centers were identified in each zone as follows:

1. Zone 1: Hagonoy
2. Zone 2: Sta. Elena
3. Zone 3: Estancia
4. Zone 4: Ubay
5. Zone 5: Surigao City
6. Zone 6: General Santos City
7. Zone 7: Pagadian City
8. Zone 8: Himamaylan
9. Zone 9: Ponot
10. Zone 10: Marawi City
11. Zone 11: Datu Piang

6. Selection of Proto-type Site

1) Selection Criteria of Proto-type Site

Proto-type sites were selected according to the following two-step procedure:

Step 1: From Marketing Conditions

- 1) Fish production in 2000
- 2) Major kinds of fish by capture fishing in main fishing grounds
- 3) Fishpond production
- 4) Ice shortage in 2000
- 5) Presence of ice plants

Step 2: From Infrastructural Conditions

- 1) Energization and energy charge
- 2) Waterworks system by LWUA and RWDC
- 3) Accessibility to National Road with road surface conditions

2) Selected Proto-type Sites

Proto-type sites were selected as shown in Table _____.

7. Requirement of IPCS by Zone by Proto-type

7.1 Requirement of IPCS by Region

Additional investment by the Project will be required to cover the shortage of ice plant at a rated capacity of 1,673 tons/day in 1983, 3,213 tons/day in 1990 and 4,340 tons/day in 2000. Zone system should share 88.7% of total requirement of the project in 1983 and 91.9% in 2000 while that by proto-type system is 11.3% in 1983 and 8.1% in 2000.

The project will be composed of 3,987 tons/day by zone system and 353 tons/day by proto-type system. Contribution of government sector will be followed according to the government policy in which 20% of investment in construction sector is planned to be satisfied by government investment.

7.2 Requirement of IPCS by Zone

Three cases are considered for the requirement of public ice plant by zone which will be established after 1983 up to 2000.

Case 1: To satisfy 100% by public plant

Case 2: To satisfy 20% by public plant

Case 3: 100% for small scale plants and 20% for large scale plants.

Case 3 is the most recommendable capacity of ice plant considering the role of government and the competition with private sector.

In case 3 required capacity for fishery sector will be 155.6 tons/day in Zone 3, 124.2 tons/day in Zone 7 and 123.6 tons/day in Zone 9 by public sector. And secondly, those are to be 93.7 tonners for Zone 6 and 86.1 tonners for Zone 8. About 50 tonners ice plant will be required in Zones 1, 2, 4, 5, 10 and 11. The requirement is shown under the conditions of without ice storage.

7.3 Requirement of IPCS by Proto-type

Assuming that the private sector has no active incentives to invest in remote areas, public sector should have a role completely to cover the ice shortage in case of less than 5 tonner requirement, while the capacity over 5 tonners is supplied by private sector by

80% and by public sector by 20% of total requirement.

Proto-types by plant capacity were selected to be as follows considering the distribution of number of sites by plant capacity in all the proposed sites except the sites included in zone system.

- 1) 1 tonner plant: 24 sites
- 2) 3 tonner plant: 11 sites
- 3) 5 tonner plant: 3 sites
- 4) 10 tonner plant: 1 site
- 5) 15 tonner plant: 2 sites

8. Identification of Ice Type

According to Field Surveys I and II of the Study, block ice is exclusively used in fishing/harvesting and marketing/transportation of ice. However, users' preference was derived from the efficiency and economical use of ice rather than type of ice. Ice type will be identified through financial evaluation both for fishermen to use ice and for ice plant operators to sell ice, considering the following factors:

- 1) Fishing sector by site
- 2) Volume of ice delivery
- 3) Capacity of ice plant and ice storage
- 4) Space of building/facilities
- 5) Initial investment cost for building and machinery
- 6) Quantity of water
- 7) Volume of energy consumption
- 8) Manpower and labor cost
- 9) Operation and maintenance
- 10) Supply of spare parts
- 11) Introduction of styrofoam box and other treatment method.

Table 2 PROJECTION OF GDP; POPULATION, PER CAPITA GDP,
AND FISH DEMAND IN THE PHILIPPINES

	1983	1990	2000	Average Annual Growth Rate (%)	
				1983-1990	1990-2000
1. GDP (₱ 10 ⁶ at 1972 price)	100,120	115,796	168,401	2.1	3.8
2. Population (₱ 10 ³)	52,055	61,481	75,224	2.4	2.0
3. Per Capita GDP (₱ at 1972 price)	1,923	1,883	2,239	-0.3	1.7
4. Demand & Supply for Fish (10 ³ t)					
1) Domestic Consumption	1,582.3	1,936.6	2,474.9	2.9	2.5
2) Export	57.2	97.8	190.2	8.0	6.9
Total Demand	1,639.5	2,034.4	2,665.1		
3) Import (less)	29.0	33.8	31.4	2.2	-0.7
4) Domestic Supply (Fish Production)	1,610.5	2,000.5	2,633.7	3.1	2.8

- Remarks: (1) GDPs of 1984 to 1987 are planned as the preliminary revision of the Five-Year Development Plan. Annual growth rates of GDP by major items of expenditure of 1986 to 1987 were applied for estimation of 1990 and 2000.
- (2) Per Capita fish consumption was projected, considering the real growth rate of per capita income and income elasticity of fish consumption, 0.2.
- (3) Volume of fish catch was converted to edible portion of fish.
- Sources: (1) GDP; Preliminary Revised Five-Year Development Plan, Aug. 1984, NEDA.
- (2) Population; Population Projections of the Philippines and its Regions, 1980-2030, NEDA.
(Based on the 1980 Census of Population and Housing Revised Population Projection, Series 2)

Table 2 PROJECTION OF FISH PRODUCTION BY SECTOR IN THE PHILIPPINES

Sector	Fish Production (10 ³ MT)			Average Annual Growth Rate (%)	
	1983	1990	2000	1983-1990	1990-2000
1. COMMERCIAL FISHERIES					
1) Marine Traditional Commercial Fisheries	479.3	556.2	671.1	2.1	1.9
2) Marine Oceanic Commercial Fisheries	40.0	82.2	217.5	10.8	10.2
SUB - TOTAL	519.3 (32.2)	638.4 (31.9)	888.6 (33.7)	3.0	3.4
2. MUNICIPAL FISHERIES					
1) Marine Municipal Fisheries	690.3	769.8	841.0	1.6	0.9
2) Inland Municipal Fisheries	119.3	144.5	165.1	2.8	1.3
SUB - TOTAL	809.6 (50.3)	914.3 (45.7)	1,006.1 (38.2)	1.8	1.0
3. AQUACULTURE	281.6 (17.5)	447.9 (22.4)	739.0 (28.1)	6.9	5.1
TOTAL IN THE PHILS.	1,610.5 (100.0)	2,000.6 (100.0)	2,633.7 (100.0)	3.1	2.8

Remarks: (1) Volume of fish catch was converted to edible portion of fish.
(2) Supply of 1983 is actual volume and was divided into sectors based on the estimated volume for 1983.

Source : (1) Revised Date of IFDP, 1984, FIDC.
(2) Fisheries Statistics in the Philippines, 1977-83, BFAR.
(3) 1983 Philippine Statistical Yearbook, 1983, NEDA.
(4) Preliminary Revised Five-Year Development Plan, Aug., 1984, NEDA.

Table FISH PRODUCTION BY REGION

Unit: 10^3 M.T.

Region	Production			Annual Average Growth Rate (%)	
	1983	1990	2000	1983-1990	1990-2000
N C R	177.4	246.5	385.8	4.8	3.8
I	29.8	50.7	60.0	7.9	1.7
II	5.1	6.2	9.6	2.8	4.5
III	92.1	166.4	209.3	8.8	2.3
IV	335.7	375.1	488.2	1.6	2.7
V	106.3	109.3	131.5	0.4	1.9
VI	361.1	395.8	466.7	1.3	1.7
VII	51.0	53.1	70.5	0.6	2.9
VIII	46.3	47.0	60.7	0.2	2.6
IX	256.5	320.2	437.3	3.2	3.2
X	66.9	69.8	80.0	0.6	1.4
XI	61.7	76.4	120.4	3.1	4.7
XII	65.6	84.1	113.7	3.6	3.1
PHILS.	1,610.5	2,000.6	2,633.7	3.1	2.8

Remarks: (1) Excluding seaweed and non-edible portion of shells and snails.

Sources: 1982 Fisheries Statistics of the Philippines, BFAR
 1983 Fisheries Statistics of the Philippines
 (Preliminary Data), BFAR.

TABLE FISH PRODUCTION BY COMMERCIAL FISHERIES

Unit: 10³M.T.

Region	Production			Annual Average Growth Rate(%)	
	1983	1990	2000	1983 - 1990	1990 - 2000
NCR	170.2	239.2	376.6	4.98	4.64
I	2.1	2.1	2.1	0	0
II	1.5	1.5	1.5	0	0
III	7.2	10.7	18.8	5.82	5.80
IV	52.8	52.8	52.8	0	0
V	34.1	34.1	34.1	0	0
VI	123.9	126.0	132.8	0.24	0.53
VII	20.3	21.9	26.7	1.09	2.00
VIII	9.1	9.1	9.1	0	0
IX	64.4	92.9	155.2	5.37	5.27
X	5.0	6.7	9.1	4.27	3.11
XI	27.7	40.4	68.8	5.54	5.47
XII	1.0	1.0	1.0	0	0
Philippines	519.3	638.4	888.6	2.99	3.36

Remarks: (1): Excluding seaweed and non-edible portion of shells and snails.

(2): Commercial fishing: Commercial traditional and oceanic fishing.

Source : 1982 Fisheries Statistics of the Philippines, BFAR
 1983 Fisheries Statistics of the Philippines
 (Preliminary Data), BFAR

TABLE FISH PRODUCTION BY MUNICIPAL FISHERIES

Unit: 10³ M.T.

Region	Production			Annual Average Growth Rate (%)	
	1983	1990	2000	1983 - 1990	1990 - 2000
NCR	6.5	6.5	6.5	0	0
I	9.1	9.3	9.5	0.31	0.21
II	2.4	2.5	2.5	0.58	0
III	18.1	19.6	20.7	1.14	0.55
IV	181.7	205.6	226.8	1.78	0.99
V	65.5	66.4	67.2	0.20	0.12
VI	136.5	162.5	185.7	2.52	1.34
VII	26.2	26.2	26.2	0	0
VIII	32.3	32.3	32.3	0	0
IX	183.5	217.6	248.1	2.46	1.32
X	59.4	60.2	60.9	0.19	0.12
XI	29.2	29.5	29.7	0.15	0.07
XII	59.2	76.1	90.0	3.65	1.69
Philippines	809.6	914.3	1,006.1	1.75	0.96

Remarks: (1): Excluding seaweed and non-edible portion of shells and snails.

(2L: Municipal fishing: Municipal marine and inland fishing.

Source: 1982 Fisheries Statistics of the Philippines, BFAR
 1983 Fisheries Statistics of the Philippines
 (Preliminary Data), BFAR

TABLE FISH PRODUCTION, BY AQUACULTURE

Unit: 10³ M.T.

Region	Production			Annual Average Growth Rate(%)	
	1983	1990	2000	1983 - 1990	1990 - 2000
NCR	0.7	0.8	2.7	1.93	12.93
I	18.5	39.3	48.4	11.36	2.10
II	1.2	2.2	5.6	9.05	9.79
III	66.8	136.1	169.8	10.70	2.24
IV	101.2	116.7	208.6	2.06	5.98
V	6.7	8.8	30.2	3.97	13.12
VI	55.7	107.3	148.2	9.82	3.28
VII	4.5	5.0	17.6	1.52	13.41
VIII	4.9	5.6	19.3	1.93	13.17
IX	8.6	9.7	34.0	1.73	13.36
X	2.5	2.9	10.0	2.14	13.18
XI	4.8	6.5	21.9	4.43	12.92
XII	5.4	7.0	22.7	3.78	12.48
Philippines	281.5	447.9	739.0	6.86	5.13

Remarks: (1): Excluding seaweed and non-edible portion of shells and snails.
 (2): Fishpond/Aquaculture: Brackishwater and fresh water fishpond, fish pen and cage and sea farming.

Source: 1982 Fisheries Statistics of the Philippines, BFAR
 1983 Fisheries Statistics of the Philippines
 (Preliminary Data), BFAR

Table FRESH FISH RATIO IN TOTAL FISH PRODUCTION

Region	Pre-Estimation in Phase I Study	Estimation in Phase II Study	
	1983	1983	2000
N C R	79.1	69.9	94.0
I	97.0	86.1	95.6
II	87.0	59.1	70.5
III	100.0	83.8	88.2
IV	73.0	74.7	88.0
V	84.0	75.3	84.9
VI	72.0	79.2	87.2
VII	80.0	80.7	90.9
VIII	79.0	75.0	88.7
IX	74.9	69.3	83.1
X	75.0	73.9	83.5
XI	78.0	81.9	99.6
XII	75.0	79.0	91.0
PHILIPPINES	-	75.1	88.0

Table 4 RATED CAPACITY OF THE EXISTING OPERATED IPCS IN 1983

Region	Private Sector			Public Sector			T o t a l		
	Ice Plant (t/day)	Cold Storage (t)		Ice Plant (t/day)	Cold Storage (t)		Ice Plant (t/day)	Cold Storage (t)	
		C	F		C	F		C	F
N C R	5,503	59,763	57,365	0	0	0	5,503	59,763	57,365
I	806	2,578	-	0	0	0	806	2,578	-
II	296	508	-	0	0	0	296	508	-
III	1,927	9,737	-	0	0	0	1,927	9,737	-
IV	1,847	533	195	70	40	0	1,917	573	195
V	576	228	46	10	-	50	586	228	96
VI	1,491	150	67	0	0	0	1,491	150	67
VII	416	-	275	10	20	0	426	20	275
VIII	246	193	37	10	-	50	256	193	87
IX	515	58	145	10	20	0	525	78	145
X	178	195	226	0	0	0	178	195	226
XI	580	-	315	0	0	0	580	0	315
XII	195	60	-	0	0	0	195	60	-
TOTAL	14,576	74,003	58,671	110	80	100	14,686	74,083	58,771

- Remarks:
- (1) 1 m^3 of cold storage = 0.35 t
 - (2) Cold storage; C = Chilling (+ 5 to - 5°C) F = Freezing (below -15°C)
 - (3) PFDA's plants transferred from BEAR are ^{the} only the existing operated plants among the public plants
 - (4) Existing operated IPCS excludes the plants for closures, under test run, under rehabilitation, non-operational, under construction & before construction.

- Source :
- (1) List of the Private Existing IPCS of APICSO in Metro Manila; January 1984, APICSO.
 - (2) List of the Private Existing IPCS APICSO in Luzon, February 3, 1984, APICSO.
 - (3) List of Private Existing IPCS by APICSO, May 1984.
 - (4) Situation on Ice Plant and Cold Storage in Zamboanga City, June 1982, PFDA.
 - (5) List of Operational and Non-Operational Ice Plants in Iloilo, May 1984, PFDA-AOC, Iloilo City.
 - (6) Field Survey I, The Study of Master Plan for Nationwide IPCS Network System, March 1984, JICA.
 - (7) Field Survey II, The Study of Master Plan for Nationwide IPCS Network System, August 1984, JICA.
 - (8) PFDA IPCS STATUS REPORT AS OF JULY 15, 1984, Aug., 1984.
 - (9) Bicol Fishing Port Network, Update study, August 1983, MPWH.
 - (10) Pangasinan Fishing Port Network, Update studies, August 1983, MPWH.
 - (11) Capacity of the Fishing Port Complex Facilities of Package II, MPWH.
 - (12) Comparison of Refrigeration Facilities (Iloilo, Sual, Lucena, Camaligan and Zamboanga), 1982 and 1983, MPWH.
 - (13) Technical Specifications of Navotas IPCS Facility, Published Dec. 1978, PFDA.
 - (14) Northern Palawan Fisheries Development Project (ADB).
 - (15) National Fisheries Development Project (IBRD).

Table 5 RATED CAPACITY OF THE EXISTING COMPLETED IPCS IN 1983

Region	Private Sector			Public Sector			T o t a l		
	Ice Plant (t/day)	Cold Storage (t)		Ice Plant (t/day)	Cold Storage (t)		Ice Plant (t/day)	Cold Storage (t)	
		C	F		C	F		C	F
N C R	5,503	59,763	57,365	250	1,344	588	5,733	61,107	57,953
I	806	2,578	-	5	20	0	811	2,598	-
II	296	508	-	5	-	30	301	508	- 30
III	1,927	9,737	-	8	50	0	1,932	9,787	-
IV	1,847	533	195	75	60	0	1,922	593	195
V	576	228	46	25	20	100	601	248	146
VI	1,491	150	67	15	56	50	1,506	200	117
VII	416	-	275	10	20	0	426	20	275
VIII	246	193	37	60	0	400	306	193	437
IX	515	58	145	65	80	0	580	138	145
X	178	195	226	40		350	218	195	576
XI	580	-	315	40		350	620	0	665
XII	195	60	-	0	0	0	195	60	=
TOTAL	14,576	74,003	58,671	595	1,644	1,868	15,171	75,647	60,539

- Remarks: (1) 1 m^3 of cold storage = 0.35 t
(2) Cold storage: C = Chilling (+ 5 to - 5°C) F = Freezing (below -15°C)
(3) PFDA's plants transferred from BFAR and NFPC are only the existing completed plants among the public plants.
(4) Existing completed IPCS excludes the plants for closure, under/before construction.
- Sources: (1) List of the Private Existing IPCS of APICSO in Metro Manila; Jan., 1984, APICSO.
Source : (2) List of the Private Existing IPCS APICSO in Luzon, Feb. 3, 1984, APICSO.
(3) List of Private Existing IPCS by APICSO, May 1984.
(4) Situation on Ice Plant and Cold Storage in Zamboanga City, June 1982, PFDA.
(5) List of Operational and Non-Operational Ice plants in Iloilo, May 1984, PFDA-AOC, Iloilo City.
(6) Field Survey I, The Study of Master Plan for Nationwide IPCS Network System, March 1984, JICA.
(7) Field Survey II, The Study of Master Plan for Nationwide IPCS Network System, August 1984, JICA.
(8) PFDA IPCS STATUS REPORT AS OF JULY 15, 1984, Aug., 1984.
(9) Bicol Fishing Port Network, update study, August 1983, MPWH.
(10) Pangasinan Fishing Port Network, update studies, August 1983, MPWH.
(11) Capacity of the Fishing Port Complex Facilities of Package II, MPWH.
(12) Comparison of Refrigeration Facilities (Iloilo, Sual, Lucena, Camaligan and Zamboanga), 1982 and 1983, MPWH.
(13) Technical Specifications of Navotas IPCS Facility, Published Dec. 1978, PFDA.
(14) Northern Palawan Fisheries Development Project (ADB).
(15) National Fisheries Development Project (IBRD).

Table 14 REQUIREMENT OF THE RATED CAPACITY OF ICE PLANT
FOR FISHERIES SECTOR WITHOUT FUTURE INVESTMENT

Unit: ME/Day

Region	1 9 8 3			1 9 9 0			2 0 0 0		
	S	D	S-D	S	D	S-D	S	D	S-D
N C R	2,311	931	1,380	2,311	1,459	852	2,311	2,505	-194
I	645	140	505	645	282	363	645	302	343
II	237	20	217	237	23	214	237	32	205
III	1,542	539	1,003	1,542	1,056	486	1,542	1,253	289
IV	1,534	2,051	- 517	1,534	2,580	-1,046	1,534	3,273	-1,739
V	469	532	- 63	469	526	- 57	469	576	- 107
VI	1,193	2,118	- 925	1,193	2,692	-1,499	1,193	3,067	-1,874
VII	340	207	133	340	217	123	340	277	63
VIII	205	200	5	205	195	10	205	248	- 43
IX	420	1,741	-1,321	420	2,399	-1,979	420	3,373	-2,953
X	142	391	- 249	142	402	- 260	142	419	- 277
XI	464	434	30	464	519	- 55	464	846	- 382
XII	156	327	- 171	156	450	- 294	156	609	- 453
TOTAL	9,658	9,631	27	9,658	12,800	-3,142	9,658	16,780	-7,122

- Remarks: (1) Future investment includes both of private & public investments.
(2) Ice/fish ratio was assumed to be as follows:
a) For fishing/harvesting; 0.9 of commercial fisheries in NCR and 0.8 in other Regions, 0.5 of municipal fisheries and 0.4 of aquaculture.
b) For marketing/transportation: 0.9 of inter-Regional flow of fish, 0.6 of inter-municipal flow within the Region and no use of ice of the internal flow within the municipality.
(3) Ice is sold to fisheries sector by 42% of total ice production in NCR and 80% in the other areas by the ice plants.
(4) Operational days of the ice plant are assumed to be 300 days in a year while the operational ratio is 50% of rated capacity.

Sources: 1982 Fisheries Statistics of the Philippines, BFAR
1983 Fisheries Statistics of the Philippines
(Preliminary Data), BFAR

Table SELECTION OF PRIORITY PROVINCES

Region	I n d e x						R a n k i n g					
	A	B	C	D	E	A	B	C	D	E	F	
III	1. Bulacan	92	2	Wide	-	Good	△	o	o	o	o	o
	2. Zambales	59	0	Wide	-	NO	△	X	o	o	X	o
IV	3. Laguna	1,149	0	Supply from NCR	-	NO	o	X	X	o	X	X
	4. Quezon	166	1	Wide	FPPI	NO	△	o	o	X	X	X
	5. Oriental Mindoro	26	0	Wide	-	NO	△	X	o	o	X	X
	6. Occidental Mindoro	114	0	Wide	-	NO	△	X	o	o	X	X
	7. Marinduque	28	1	Small	-	NO	△	o	X	o	X	X
	8. Palawan	421	4	Wide	ADB	Poor	o	o	o	X	X	X
V	9. Camarines Norte	35	3	Wide	-	Good	△	o	o	o	o	o
VI	10. Iloilo	559	4	Wide	FPPI	Good	o	o	o	X	o	o
	11. Capiz	92	0	Wide	-	NO	△	X	o	o	X	X
	12. Aklan	56	1	Small	-	NO	△	o	X	o	X	X
	13. Antique	64	0	Wide	-	NO	△	X	o	o	X	X
	14. Negros Occidental	819	2	Wide	FPPII (planned)	Poor	o	o	o	X	X	o
VII	15. Bohol	41	3	Wide	-	Good	△	o	o	o	o	o
IX	16. Zamboanga del Norte	1,750	0	Wide	-	NO	o	X	o	o	X	o
	17. Zamboanga del Sur	675	4	Wide	FPPI	Fair	o	o	o	X	o	o
	18. Basilan	292	1	Small	-	NO	o	o	X	o	X	X
X	19. Sulu	146	0	Small	-	NO	△	X	X	o	X	X
	20. Surigao del Norte	197	5	Wide	-	Fair	o	o	o	o	o	o
XI	21. South Cotabato	336	2	Wide	-	Fair	o	o	o	o	o	o
XII	22. Lanao del Sur	210	3	Wide	-	Good	o	o	o	o	o	o
	23. Maguindanao	267	1	Wide	-	NO	o	o	o	o	X	o

- Remarks: (1) Ice plant requirement in 2000; more than 25 tons/day of total ice plant capacity, in which public plant is 5 tons/day supplied by public sector corresponding to 20% of total plant capacity. Rated capacity of 5 tons/day is the lowest limit of financial viability of the plant.
- (2) Presence of the national project
 FPP's of Iloilo and Zamboanga provinces are located in the cities.
 RFP were completed in Iloilo City and under construction in Zamboanga City, but the requirement is still high in the rural area of Iloilo/Zamboanga provinces.
- (3) o: Advantageous
 △: Medium
 X: Disadvantageous
- (4) Initials on Index and Ranking
 A - Ice plant requirement in 2000 (ton/day); B - Number of proposed sites by PFDA;
 C - Marketable area of ice; D - Presence of the National project of IPCS;
 E - Transportation among the proposed sites; F - Selection as a priority province

RANKING OF SITE AS A ZONE CENTER
FROM MARKETING ASPECT ON IPCS (1/3)

	Index				Ranking					
	A	B	C	D	A	B	C	D	AP	SZ
1. Zone 1										
1) Abucay	4,178	-23.5	0	X	2	2	5	1	2.5	X
2) Samal	1,637	-6.7	0	X	1	1	5	1	2.0	X
3) Hagonoy	16,580	-116.5	0	O	5	5	5	5	5.0	O
4) Obando	4,830	-30.9	0	X	3	3	5	1	3.0	X
5) Masinloc (*)	12,099	-85.8	12.0	O	4	4	1	4	3.3	X
2. Zone 2										
1) Sta. Elena	2,644	-14.1	0	O	3	3	4	4	3.5	O
2) J. Panganiban	2,330	+21.4	32.0	X	2	1	2	1	1.5	X
3) Capalonga	730	-2.1	0	X	1	2	4	1	2.0	X
4) Mercedes (*)	8,970	-30.8	36.0	O	4	4	1	4	3.3	X
3. Zone 3										
1) Concepcion	8,033	-53.3	0	X	2	1	6	1	2.5	X
2) San Dionisio	7,119	-46.8	0	X	1	2	6	1	2.5	X
3) Estancia	11,577	-89.4	0	O	5	5	6	6	5.5	O
4) Ajuí (*)	14,076	-92.6	0	-	6	6	6	-	-6.0	X
5) Carles (*)	10,235	-65.5	0	-	4	3	6	-	4.3	X
6) Panay (*)	9,954	-73.6	0	-	3	4	6	-	4.3	X
4. Zone 4										
1) Tagbilaran	1,718	+5.0	12.0	X	1	1	1	2	1.3	X
2) Ubay	4,216	-16.4	1.6	X	2	2	2	1	1.8	O

Remarks: (1) *; The sites of * were not proposed by PFDA but show much shortage of ice in each zone in 1983.

(2) Ranking was shown in advantageous points by item of index in each zone.

(3) In Surigao City, the rated capacity of PFDA plant was excluded because of being included as plants of the zone center.

(4) Index/Ranking means: A-Fish Production in 2000 (t/year); B-Ice shortage in 2000 (t/day); C-Existing IPCS in 1983 (t/day); D-Fish/Ice distribution center (O; Yes, X; NO); AP-Average Points; SZ-Selection of Zone Center (O, Zone Center).

RANKING OF SITE AS A ZONE CENTER
FROM MARKETING ASPECT ON IPCS (2/3)

	Index				Ranking					
	A	B	C	D	A	B	C	D	AP	SZ
5. Zone 5										
1) Surigao City	8,442	-43.3	0	O	7	7	7	7	7.0	O
2) Bacuag	505	-1.6	0	X	1	1	7	1	2.5	X
3) Claver	2,800	-18.9	0	X	3	3	7	1	3.5	X
4) Dapa	3,810	-25.8	0	X	5	5	7	-	5.7	X
5) Placer	2,013	-13.4	0	X	2	2	7	1	3.0	X
6) Malimono (*)	4,975	-34.7	0	-	6	6	7	-	6.3	X
7) San Francisco(*)	3,573	-25.2	0	-	4	4	7	-	5.0	X
6. Zone 6										
1) Gen. Santos	74,296	-453.1	204.0	O	2	2	2	2	2.0	O
2) Suralah	4,635	-24.0	1.6	X	1	1	1	1	1.0	X
7. Zone 7										
1) Pagadian City	11,566	-32.5	44.0	O	6	3	1	5	3.8	O
2) MargosaTubig	7,154	-46.7	4.0	X	4	4	2	1	2.8	X
3) Naga	2,543	-18.6	0	-	2	2	6	-	3.3	X
4) Payao	405	-1.1	0	-	1	1	6	-	2.7	X
5) San Pablo (*)	11,238	-86.0	0	-	5	6	6	-	5.7	X
6) Tukuran (*)	6,043	-50.5	0	-	3	5	6	-	4.7	X
8. Zone 8										
1) Himamaylan	19,180	-136.5	0	-	4	4	4	-	4.0	O
2) Binalbagan (*)	10,238	-136.2	0	-	3	3	4	-	3.3	X
3) Hinigaran (*)	7,367	-99.4	32.0	-	2	2	1	-	1.7	X
4) Ilog (*)	4,157	-52.5	0	-	1	1	4	-	2.0	X

- Remarks: (1) *; The sites of * were not proposed by PFDA but show much shortage of ice in each zone in 1983.
- (2) Ranking was shown in advantageous points by item of index in each zone.
- (3) In Surigao City, the rated capacity of PFDA plant was excluded because of being included as plants of the zone center.
- (4) Index/Ranking means: A - Fish Production in Zone (t/year); B - Ice shortage in 2000 (t/day); C - Existing IPCS in 1983 (t/day); D - Fish/Ice distribution center (0; Yes, X; NO); AP - average Points; SZ - Selection of Zone Center (O, Zone Center).

RANKING OF SITE AS A ZONE CENTER
FROM MARKETING ASPECT ON IPCS(3/3)

	Index				Ranking					
	A	B	C	D	A	B	C	D	AP	SZ
4) Ilog (*)	4,157	-52.6	0	-	1	1	4	-	2.0	X
9. Zone IX										
1) Sindangan (*)	17,537	-119.9	10.4	-	3	3	1	-	2.3	X
2) Ponot (*)	15,393	-119.6	0	-	2	2	3	-	2.3	O
3) P.M.Roxas (*)	11,108	-84.6	0	-	1	1	3	-	1.7	X
10. Zone 10										
1) Poonza Bayabao	1,077	-6.9	0	-	1	1	3	-	1.7	X
2) Ganassi	1,823	-12.5	0	-	2	2	3	-	2.3	X
3) Marawi City	4,424	-23.0	0	-	3	3	3	-	3.0	O
11. Zone 11										
1) Buluan	4,195	-27.3	0	-	1	1	4	-	2.0	X
2) Cotabato City(*)	11,920	-53.0	16.0	-	4	4	1	-	3.0	X
3) Datu Piang (*)	5,552	-36.5	0	-	3	3	4	-	3.3	O
4) Dinalig (*)	4,842	-30.1	0	-	2	2	4	-	2.7	X

- Remarks: (1) *; The sites of * were not proposed by PFDA but show much shortage of ice in each zone in 1983.
- (2) Ranking was shown in advantageous points by item of index in each zone.
- (3) In Surigao City, the rated capacity of PFDA plant was excluded because of being included as plants of the zone center.
- (4) Index/Ranking means: A-Fish Production in Zone (t/year); B-Ice shortage in 2000 (t/day); C-Existing IPCS in 1983 (t/day); D-Fish/Ice distribution center; (O; Yes, X; No); AP-Average Points; SZ-Selection of Zone Center (O; Zone Center).

Table RANKING OF SITE AS A ZONE CENTER FROM INFRASTRUCTURAL CONDITIONS

Criteria	Zone I				Zone II				Zone III			Zone IV	
	A	S	H	O	SE	MFP S	CA	J	E	CO	SD	T	U
1. Land Area and Price													
a. Available area	B	C	A	C	B	C	C	A	A	A	C	C	A
b. Land price	C	B	B	A	B	B	C	A	B	B	-	A	B
2. Land Consolidation	A	-	C	C	B	A	C	C	B	A	B	C	A
3. Water Supply													
a. Quality of water by present waterworks system	C	A	A	A	A	C	A	A	A	A	A	A	C
b. Quantity of water by present waterworks system	C	C	A	C	C	C	C	C	C	C	C	C	C
c. Water quality of other water source	A	A	-	-	A	C	A	A	A	A	A	A	A
4. Power Supply													
a. Frequency of brownouts	B	B	B	C	C	-	C	B	C	C	C	C	A
b. Extension cost of electric supply line	A	A	-	-	A	C	C	A	C	C	C	-	-
c. Energy Charge	A	A	C	A	C	-	C	C	C	C	C	A	C
5. Road Surface Condition	A	C	B	B	A	C	C	B	B	B	B	B	A
6. Accessibility between site and MFP	B	B	A	A	C	A	A	C	C	C	C	A	C
7. Accessibility to Metro Manila/Cebu	A	A	A	A	C	C	C	C	C	C	C	A	C
Average Points	2.25	2.18	2.30	2.10	1.92	1.50	1.50	2.00	1.75	1.83	1.55	2.18	2.00

Remarks: (1) Ranking

Rank A; Advantageous (Point 3)
 Rank B; Medium (Point 2)
 Rank C; Disadvantageous (Point 1)
 -; No available data

(2) Name of Sites

A - Abucay; S - Samal; H - Hagonoy; O - Obando; SE - Sta. Elena; MFP S - MFP Sta. Elena;
 CA - Capalonga; J - Jose Panganiban; E - Estancia; CO - Concepcion; SD - San Dionisio;
 T - Tagbilaran; U - Ubay.

Table REQUIREMENT OF THE RATED CAPACITY OF
ICE PLANT FOR FISHERY SECTOR IN 1990

Unit: M. T./day

Zone	Private Sector			Public Sector			Total		
	Supply	Demand	Balance	Supply	Demand	Balance	Supply	Demand	Balance
1. Project Area									
1) Zone	1,972	4,314	-2,342	0	585	- 585	1,972	4,899	-2,927
2) Proto-type	283	509	- 226	0	57	- 57	283	566	- 283
Sub-Total	2,255	4,823	-2,568	0	642	- 642	2,255	5,465	-3,210
2. Other Area									
	7,315	7,133	182	88	42	46	7,403	7,175	228
Total	9,570	11,956	-2,386	88	684	- 596	9,658	12,640	-2,982

- Remarks: (1) Ice to fishery sector is sold by 42% of total ice production by the ice plants in NCR and by 80% in the other areas.
- (2) Rated capacity of ice was estimated by municipality and aggregated to proto-type sites and zones.
- (3) Supply of rated capacity corresponds to the plant capacity of the operated ice plant in 1983.
- (4) Contribution of public sector was assumed to be 20% of total ice requirement as shown in balance.

Table REQUIREMENT OF THE RATED CAPACITY OF
ICE PLANT FOR FISHERY SECTOR IN 2000

Unit: M. T./day

Zone	Private Sector			Public Sector			Total		
	Supply	Demand	Balance	Supply	Demand	Balance	Supply	Demand	Balance
1. Project Area									
1) Zone	1,972	5,162	-3,190	0	797	- 797	1,972	5,959	-3,987
2) Proto-type	283	565	- 282	0	71	- 71	283	636	- 353
Sub-Total	2,255	5,727	-3,472	0	868	- 868	2,255	6,595	-4,340
2. Other Area									
	7,315	9,340	-2,025	88	594	- 506	7,403	9,934	-2,531
Total	9,570	15,067	-5,497	88	1,462	-1,374	9,658	16,529	-6,871

- Remarks:
- (1) Ice to fishery sector is sold by 42% of total ice production by the ice plants in NCR and by 80% in the other areas.
 - (2) Rated capacity of ice was estimated by municipality and aggregated to proto-type sites and zones.
 - (3) Supply of rated capacity corresponds to the plant capacity of the operated ice plant in 1983.
 - (4) Contribution of public sector was assumed to be 20% of total ice requirement as shown in balance.

Table REQUIREMENT OF RATED CAPACITY OF ZONE AND PROTO-TYPE SITES FOR FISHERY SECTOR BY REGION

Unit: M. T./Day

Region	1 9 8 3			1 9 9 0			2 0 0 0		
	Zone	Prototype	Total	Zone	Prototype	Total	Zone	Prototype	Total
N C R	0	0	0	0	0	0	0	0	0
I	0	19.6	19.6	0	0.2	0.2	0	-10.8	-10.8
II	0	16.0	16.0	0	16.0	16.0	0	15.9	15.9
III	418.0	0	418.0	-76.0	0	-76.0	-225.0	0	-225.0
IV	0	-107.3	-107.3	0	-155.8	-155.8	0	-193.9	-193.9
V	-41.6	-15.6	-57.2	-40.7	-27.0	-67.7	-41.5	-14.8	-56.3
VI	-573.8	-23.0	-596.8	-1,032.7	-29.7	-1,062.4	-1,208.6	-37.2	-1,245.8
VII	-19.2	0.2	-19.0	-21.4	-3.0	-24.4	-38.8	-1.8	-40.6
VIII	0	-41.6	-41.6	0	-40.3	-40.3	0	-41.1	-41.1
IX	-635.0	-10.9	-645.9	-920.8	-9.6	-930.4	-1,239.4	-11.3	-1,250.7
X	-299.9	11.4	-288.5	-299.9	7.4	-292.5	-288.5	0.2	-288.3
XI	-92.4	-0.5	-92.9	-174.4	-0.9	-175.3	-468.4	-2.9	-471.3
XII	-240.7	-37.1	-277.8	-361.3	-42.6	-403.9	-477.2	-55.1	-532.3
TOTAL	-1,484.6	-188.8	-1,673.4	-2,927.2	-285.3	-3,212.5	3,987.4	-352.8	-4,340.2

Table 6 RATED CAPACITY OF ICE PLANT FOR FISHERY SECTOR BY ZONE

Unit: M. T./Day

Zone	1 9 8 3			1 9 9 0			2 0 0 0		
	Supply	Demand	Balance	Supply	Demand	Balance	Supply	Demand	Balance
1. Zone 1	940.0	522.0	418.0	940.0	1,016.0	- 76.0	940.0	1,165.0	-225.0
2. Zone 2	68.0	109.6	-41.6	68.0	108.7	- 40.7	68.0	109.0	-41.5
3. Zone 3	464.8	793.0	-328.2	464.8	1,179.0	-714.2	464.8	1,243.0	-778.2
4. Zone 4	18.4	37.6	-19.2	18.4	39.8	- 21.4	18.4	57.2	- 38.8
5. Zone 5	8.8	308.7	-299.9	8.8	308.7	-299.9	8.8	297.3	-288.5
6. Zone 6	257.6	350.0	-92.4	257.6	432.0	-174.4	257.6	726.0	-468.4
7. Zone 7	120.0	385.8	-265.8	120.0	528.2	-408.2	120.0	741.1	-621.1
8. Zone 8	52.8	298.4	-245.6	52.8	371.3	-318.5	52.8	483.2	-430.4
9. Zone 9	18.4	387.6	-369.2	18.4	531.0	-512.6	18.4	636.7	-618.3
10. Zone 10	7.2	99.9	- 92.7	7.2	166.5	-159.3	7.2	209.6	-202.4
11. Zone 11	16.0	164.0	-148.0	16.0	218.0	-202.0	16.0	290.8	-274.8
Zone Total	1,972.0	3,456.6	-1,484.6	1,972.0	4,899.2	-2,927.2	1,972.0	5,959.4	-3,987.4

Remarks: Provinces included in each zone are as follows:

Zone 1; Bataan, Bulacan, Zambales, Pampanga

Zone 2; Camarines Norte

Zone 3; Iloilo, Capiz

Zone 4; Bohol

Zone 5; Surigao del Norte

Zone 6; South Cotabato

Zone 7; Zamboanga del Sur

Zone 8; Negros Occidental

Zone 9; Zamboanga del Norte

Zone 10; Lanao del Sur

Zone 11; Maguindanao

Table 7 CLASSIFICATION OF PROTO-TYPE SITES
AND IDENTIFICATION OF PLANT CAPACITY
FOR FISHING SECTOR

Region	Site	Index					Proto-Type			
		A	B	C	D	E	Case 1	Case 2	Case 3	
I	1. Pagudpod	71	1	10	- 0.2	0	0	0	0	
	2. Pasuquin	79	1	31	- 0.2	0	0	0	0	
	3. Magsingal	114	1	2	- 0.4	0	0	0	0	
	4. Narvacan	93	1	36	- 0.3	0	0	0	0	
	5. Damortis	1,380	1	-	17.3	24.0	0	0	0	
6. Alaminos	6,384	1	6,154	-27.0	20.0	20	5	5		
II	7. Ilaan	14	-	10	16.0	16.0	0	0	0	
	8. Bayombong	46	-	46	- 0.1	0	0	0	0	
IV	9. Balayan	2,107	3	-	-14.5	0	15	3	3	
	10. Buenavista	1,007	3	-	- 3.4	0	3	0	1	
	11. Balabac	4,493	3	-	-31.6	0	20	5	5	
	12. El Nido	9,436	1	-	-76.6	0	50	15	15	
	13. Narra	7,045	3	-	-36.5	16.0	20	10	10	
	14. Quezon	2,480	1	-	- 9.7	0	10	3	3	
	15. Unisan	3,546	2	2,275	-21.6	0	20	5	5	
	V	16. Balatan	1,589	2	-	- 0.2	8.0	0	0	0
		17. Cabusao	1,679	2	-	- 8.1	0	10	1	1
		18. Calabanga	7,187	2	20	60.8	100.8	0	-	-
19. Pasacao		10,625	2	-	-63.8	0	50	15	15	
20. Gignoto		308	2	-	- 1.1	0	1	0	1	
21. Virac		862	3	-	3.4	6.4	0	0	0	
22. Balud		1,272	3	574	- 4.8	0	5	1	1	
23. Pilar		322	2	183	- 1.0	0	1	-	1	
VI		24. New Washington	2,881	3	1,504	-15.5	0	15	3	3
		25. Tiblao	1,723	1	-	- 9.0	0	10	3	3
	26. Tigbauan	3,297	1	652	-16.7	0	15	3	3	
VII	27. San Carlos City	1,842	2	1,307	4.0	9.6	0	0	0	
	28. Toledo City	781	2	204	- 2.6	0	3	0	1	
	29. Bogo	2,453	3	63	- 8.0	4.8	10	1	1	
VIII	30. Dumaguete City	214	2	-	7.1	8.0	0	0	0	
	31. Bayawan	451	2	31	1.7	3.2	0	0	0	
	32. Borongan	236	2	110	- 0.7	0	0	0	0	
	33. Albuera	2,323	3	-	-13.0	0	15	3	3	
	34. Carigara	1,251	2	-	- 1.7	4.0	1	0	1	
	35. Dulag	27	2	-	- 0.9	0	0	0	0	
	36. Inopacan	864	3	252	- 3.6	0	3	0	1	
	37. Isabel	188	3	-	- 0.6	0	0	0	0	
	38. San Isidro	457	2	-	1.4	0	1	0	1	
	39. Tarangan	1,844	2	-	-11.1	0	10	3	3	
IX	40. Villareal	290	2	-	- 1.0	0	1	0	1	
	41. Wright	532	2	-	- 1.8	0	1	0	1	
	42. Lilcan	545	2	-	- 1.8	0	1	0	1	
	43. Maasin	722	2	84	- 0.9	1.6	0	0	0	
	44. Padre Burgos	171	2	31	- 0.5	0	0	0	0	
	45. St. Bernard	234	2	-	- 0.8	0	0	0	0	
	46. San Francisco	357	2	-	- 1.2	0	1	0	1	
	47. Sogod	266	2	-	- 0.1	0.8	0	0	0	
	X	48. Tuburan	1	1	-	-	0	0	-	-
		49. Sibutu	2,178	1	6	-11.3	0	10	3	3
XI	50. Buenavista	902	2	837	- 2.4	0	3	0	1	
	51. Cabábarah	439	2	338	6.7	8.0	0	0	0	
	52. Jabonga	294	2	-	- 1.0	0	1	0	1	
	53. Malaybalay	34	-	31	- 0.1	0	0	0	0	
	54. Catarman	610	2	-	- 2.3	0	3	0	1	
	55. Oroquieta City	4,556	2	102	-13.3	8.0	15	3	3	
	56. Ozamis City	372	2	204	18.3	19.2	0	0	0	
	57. Tangub City	316	2	114	- 0.7	0	0	0	0	
	58. Salay	1,057	2	-	- 5.0	0	5	1	1	
	XII	59. Malita	1,051	2	-	3.5	0	3	0	1
60. Caraga		247	2	-	- 0.8	0	0	0	0	
61. Gov. Generoso		825	2	-	13.3	16.0	0	0	0	
62. Lupon		966	2	-	- 3.6	0	3	0	1	
63. Mati		985	2	-	0.7	4.0	0	0	0	
64. Barobo		520	2	-	- 1.7	0	1	0	1	
65. Bislig		1,520	2	919	- 0.3	4.0	0	0	0	
66. Cagwit		407	2	-	- 1.3	0	1	0	1	
67. Cantilan		501	2	165	- 0.7	0.8	0	0	0	
68. Hinatuan		1,358	2	551	- 5.0	0	5	1	1	
XII	69. Karonatan	3,744	1	385	-21.2	0	20	5	5	
	70. Kolambugan	411	2	24	- 1.4	0	1	0	1	
	71. Tubod	283	2	207	- 0.8	0	0	0	0	
	72. Midsayap	-	-	-	-	0	-	-	-	
	73. Lebak	4,294	1	540	-18.0	0	20	3	3	
	74. Lutayan	4,394	-	-	-13.7	0	15	3	3	
TOTAL		128,352		18,002	-352.8	283.2	416	98	117	

Remarks: (1) Index

A = Fish production in 2000 (ton/year); B = Major kinds of fish in main fishing ground (The smaller number is the higher class of fish); C = Fish pond production in tons/year; D = Ice shortage in 2000 at a rated capacity (ton/day); E = Presence of existing ice plants at a rated capacity (ton/day)

(2) Case 1: Requirement of ice wholly covered by the government investment.

Case 2: 20% of ice requirement by the government investment

Case 3: 20% of ice requirement over 5 tons/day and 100% less than 5 tons/day by site.

Table REQUIREMENT OF RATED CAPACITY OF ICE PLANT FOR FISHERY SECTOR BY ZONE

	Case 1		Case 2		Case 3	
	1990	2000	1990	2000	1990	2000
1. Zone 1	76.0	225.0	15.2	45.0	15.2	45.0
2. Zone 2	40.7	41.5	8.1	8.3	40.7	41.5
3. Zone 3	714.2	778.2	142.8	155.6	142.8	155.6
4. Zone 4	21.4	38.8	4.3	7.8	21.4	38.8
5. Zone 5	299.9	288.5	60.0	57.7	60.0	57.7
6. Zone 6	174.4	468.4	34.9	93.7	34.9	93.7
7. Zone 7	408.2	621.1	81.6	124.2	81.6	124.2
8. Zone 8	318.5	430.4	63.7	86.1	63.7	86.1
9. Zone 9	512.6	618.3	102.5	123.6	102.5	123.6
10. Zone 10	159.3	202.4	31.9	40.5	31.9	40.5
11. Zone 11	202.0	274.8	40.4	55.0	40.4	55.0
Zone Total	2,927.2	3,987.4	585.4	797.5	635.1	861.7

Remarks: The following three cases are considered to be a share of public plant to total requirement of ice plant to be established after 1983.

Case 1: 100%

Case 2: 20%

Case 3: 100% for small scale plant and 20% for large scale plant.

Table REQUIREMENT OF RATED CAPACITY OF ICE PLANT FOR THE WHOLE SECTOR BY ZONE

	Case 1		Case 2		Case 3	
	1990	2000	1990	2000	1990	2000
1. Zone 1	95.0	281.3	19.0	56.3	19.0	56.3
2. Zone 2	50.9	51.9	10.1	10.4	50.9	51.9
3. Zone 3	892.7	972.7	178.5	194.5	178.5	194.5
4. Zone 4	26.7	48.5	5.4	9.8	26.7	48.5
5. Zone 5	374.9	360.6	75.0	72.1	75.0	72.1
6. Zone 6	218.0	585.5	43.6	117.1	43.6	117.1
7. Zone 7	510.3	776.4	102.0	155.3	102.0	155.3
8. Zone 8	398.1	538.0	79.6	107.6	79.6	107.6
9. Zone 9	640.8	772.9	128.1	154.5	128.1	154.5
10. Zone 10	199.1	253.0	39.9	50.6	39.9	50.6
11. Zone 11	252.5	343.5	50.5	68.8	50.5	68.8
Zone Total	3,659.0	4,984.3	731.7	997.0	793.8	1,077.2

Remarks: The following three cases are considered to be a share of public plant to total requirement of ice plant to be established after 1983.

Case 1: 100%

Case 2: 20%

Case 3: 100% for small scale plant and 20% for large scale plant.

Table SELECTION OF PROTO-TYPE SITES AND THE RATED CAPACITY OF PROTO-TYPE PLANT FOR FISHING SECTOR

Unit: MT/Day

Region	Site	Case 1						Case 2					Case 3					
		1	3	5	10	15	20	50	1	3	5	10	15	1	3	5	10	15
I	1. Alaminos						0											0
IV	2. Balayan						0											0
	3. Buenavista			0														0
	4. Balabac							0										0
	5. El Nido							0					0					0
	6. Narra							0				0						0
	7. Quezon					0					0							0
	8. Unisan							0				0						0
	V	9. Cabusao							0									
10. Pasacao												0						0
11. Gigmoto		0																0
12. Balud				0							0							0
13. Pilar		0																0
VI	14. New Washington						0											0
	15. Tibiao					0												0
	16. Tigbauan						0											0
VII	17. Toledo City			0														0
	18. Bogo					0						0						0
VIII	19. Albuera						0											0
	20. Carigara	0																0
	21. Inopacan		0															0
	22. San Isidro	0																0
	23. Tarangnan					0												0
	24. Villareal	0																0
	25. Wright	0																0
	26. Liloan	0																0
	27. San Francisco	0																0
IX	28. Sibutu					0												0
X	29. Buenavista			0														0
	30. Jabonga	0																0
	31. Cataman	0																0
	32. Oroquieta City						0											0
	33. Salay			0														0
XI	34. Malita			0														0
	35. Lupon			0														0
	36. Barobo	0																0
	37. Cagwait	0																0
	38. Hinatuan				0													0
XII	39. Karonatan						0					0						0
	40. Kolambugan	0																0
	41. Lebak						0											0
	42. Lutayan						0											0
Total Number of Plants		12	7	3	6	5	6	2	5	11	4	1	2	24	11	4	1	2

Remarks: Case 1: Requirement of ice is wholly covered by the government investment

Case 2: 20% of ice requirement by the government investment

Case 3: 20% of ice requirement over 5 tons/day and 100% less than 5 tons/day by site

PROJECTION OF COLD STORAGE REQUIREMENT
IN IPCS ZONES

IPCS ZONE	<u>1 9 8 3</u>		<u>1 9 9 0</u>		<u>2 0 0 0</u>	
	Max. MI	Max. V	Max. MI	Max. V	Max. MI	Max. V
1	-	-	-	-	-	-
2	640	1,760	941	1,568	580	1,017
3	1,416	5,663	2,346	9,149	1,970	7,226
4	-	-	-	-	-	-
5	-	-	-	-	-	-
6	-	-	-	-	-	-
7	2,417	12,811	2,914	13,355	2,969	14,597
8	1,047	4,189	1,443	5,626	1,453	5,329
9	2,309	12,239	2,793	12,801	2,482	12,201
10	-	-	-	-	-	-
11	-	-	-	-	-	-
TOTAL	7,829	36,662	10,437	42,499	9,754	40,370

Remarks: Max. MI- Maximum monthly input to be frozen.
Max. V- Maximum volume of fish to be stored.

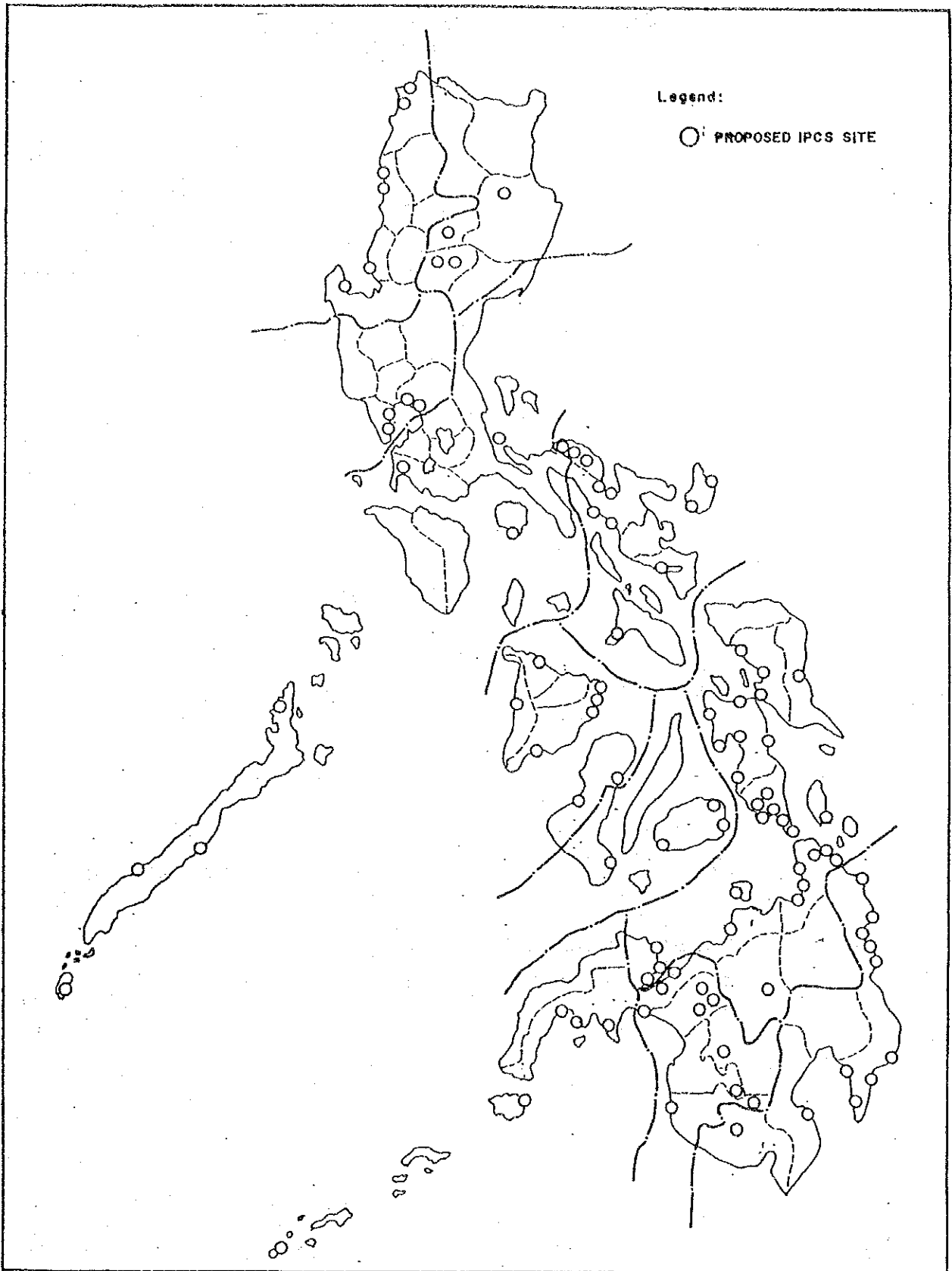


Fig. LOCATION OF PROPOSED SITES OF IPCS BY PFDA

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 THE STUDY OF MASTER PLAN FOR THE NATIONWIDE
 ICE PLANTS AND COLD STORAGE NETWORK SYSTEM
 JAPAN INTERNATIONAL COOPERATION AGENCY

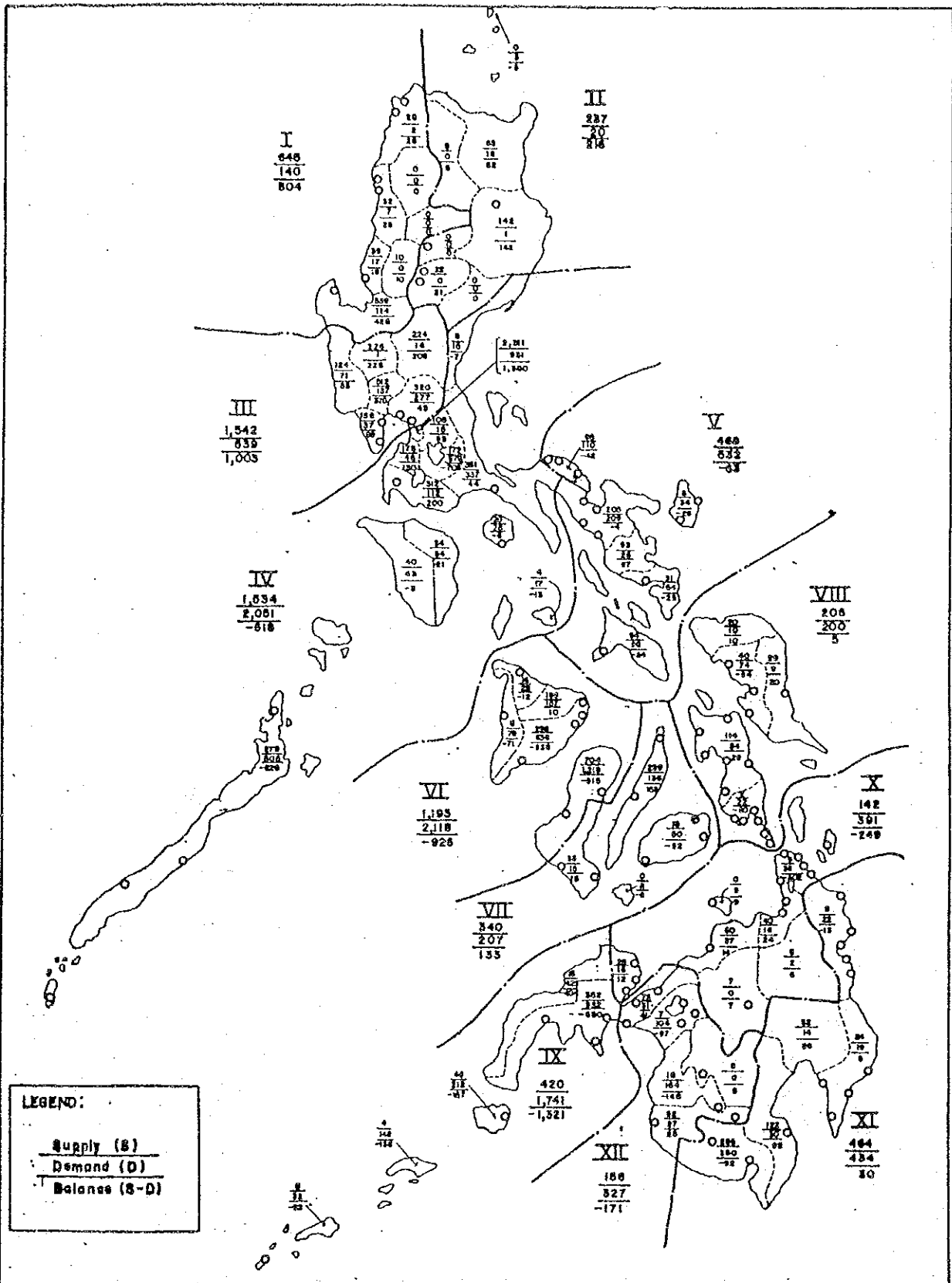


Fig. SUPPLY, DEMAND AND BALANCE OF ICE FOR FISHERIES SECTOR WITHOUT FUTURE INVESTMENT ON ICE PLANT IN 1983

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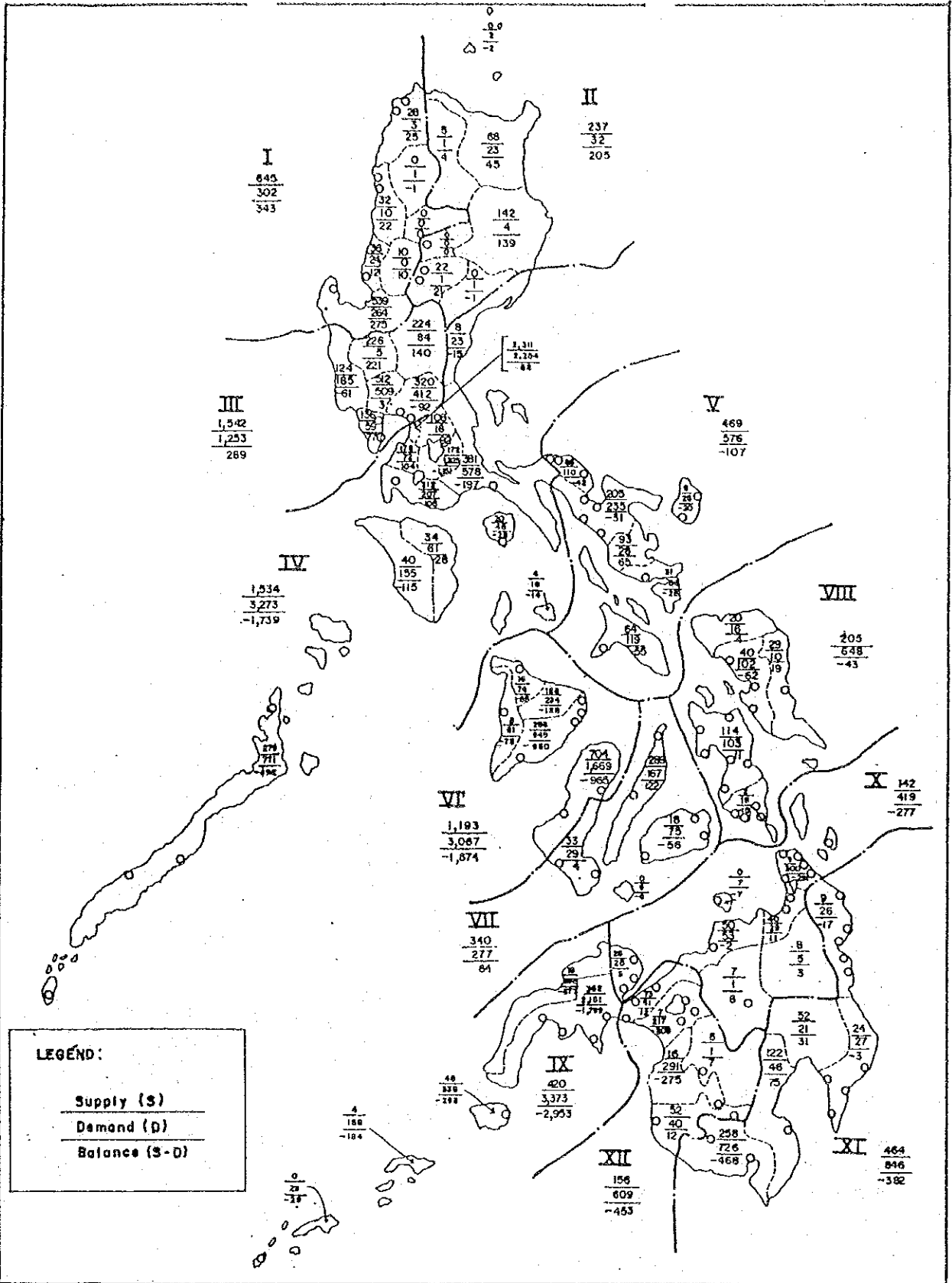


Fig. SUPPLY, DEMAND AND BALANCE OF ICE FOR FISHERIES SECTOR WITHOUT FUTURE INVESTMENT ON ICE PLANT IN 2000

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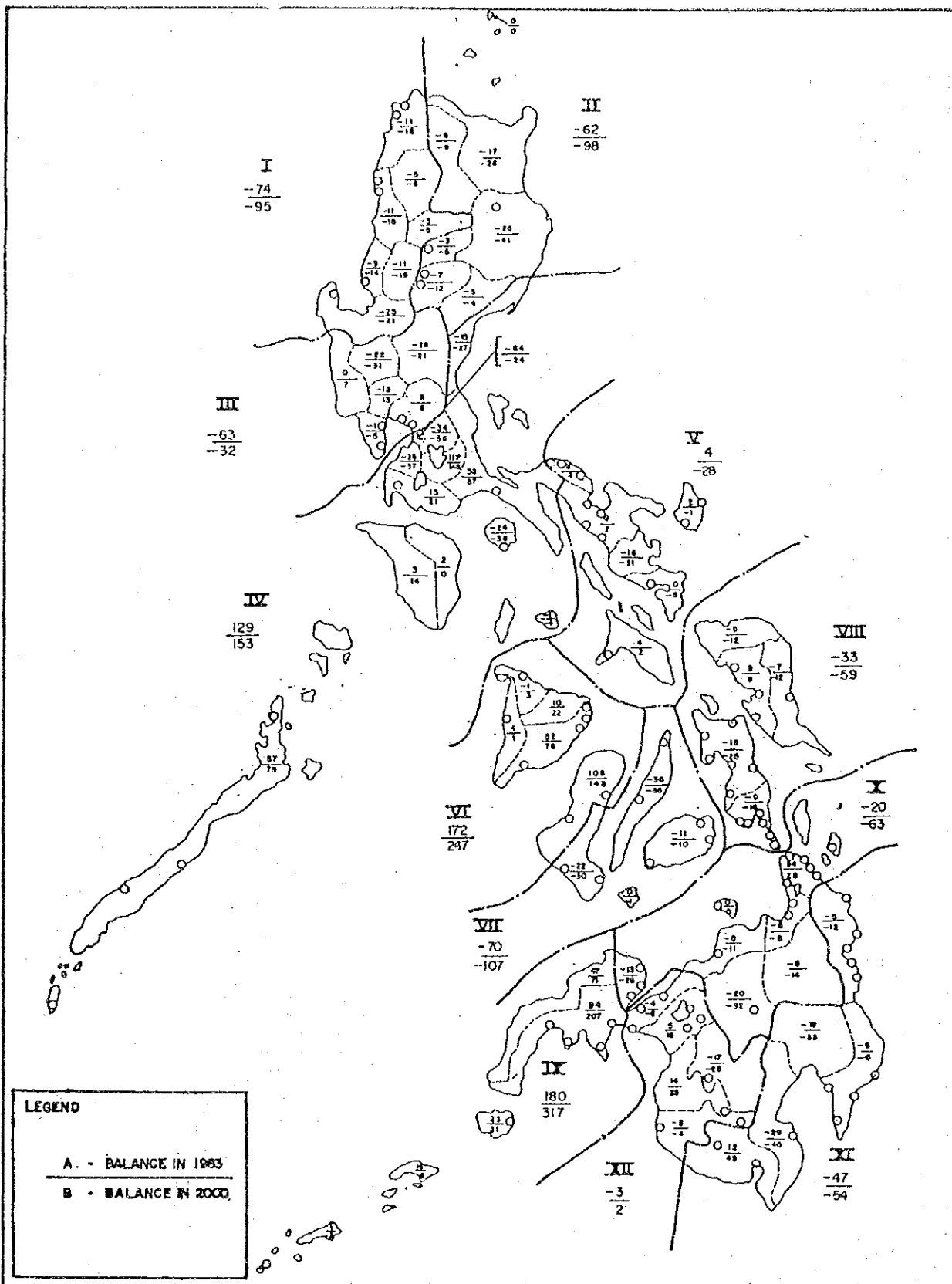


FIG. BALANCE OF FISH PRODUCTION AND DOMESTIC DEMAND FOR FISH IN 1983 AND 2000 (TENS OF THOUS TONS)

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 DEPARTMENT OF INTERIOR AND LOCAL GOVERNMENT AGENCY

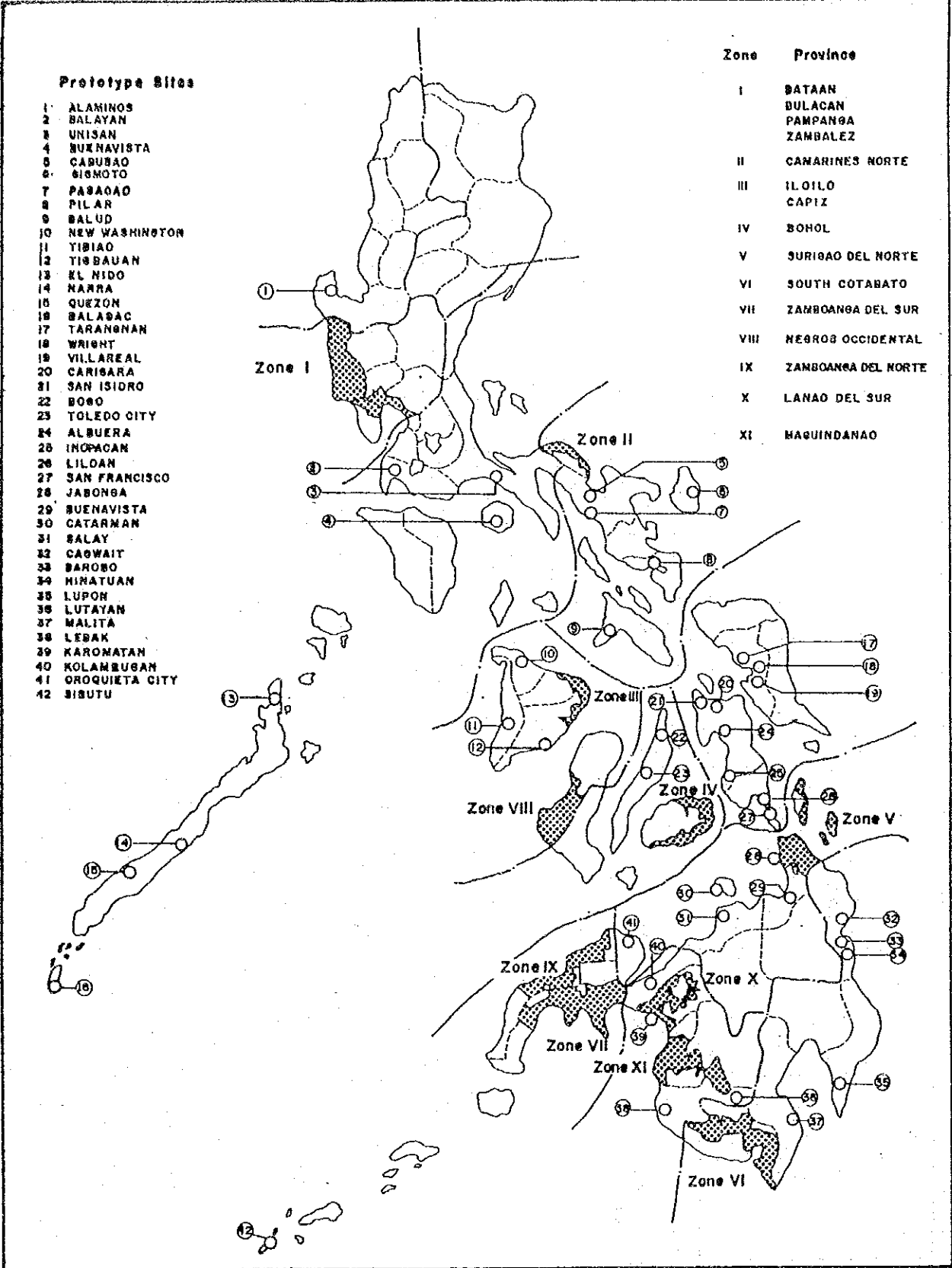


FIG. LOCATION OF ZONES AND PROTOTYPE SITES

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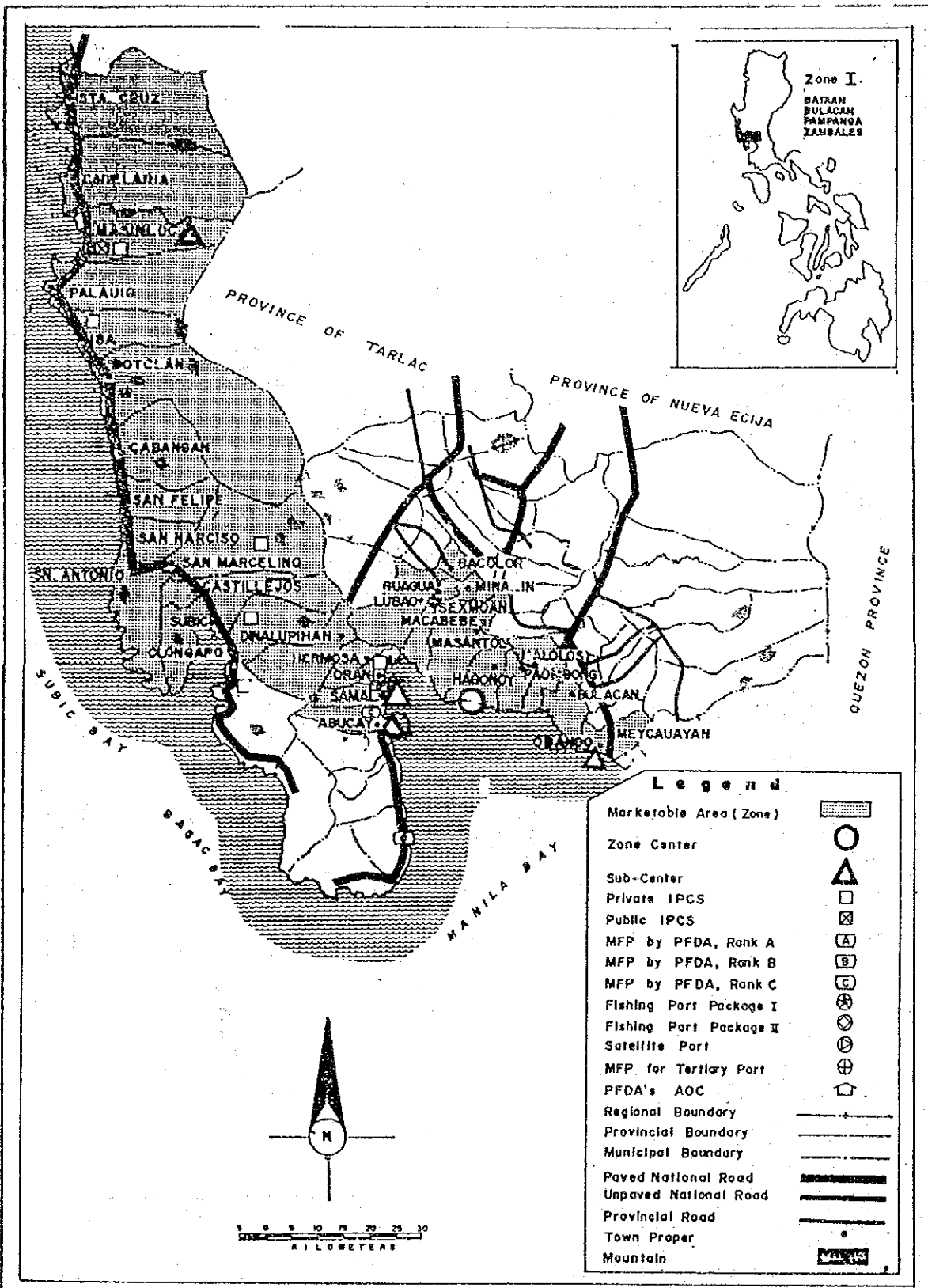


Fig. **ZONE I**

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 ICE PLANTS AND COLD STORAGES NETWORK SYSTEM
 JAPAN INTERNATIONAL COOPERATION AGENCY

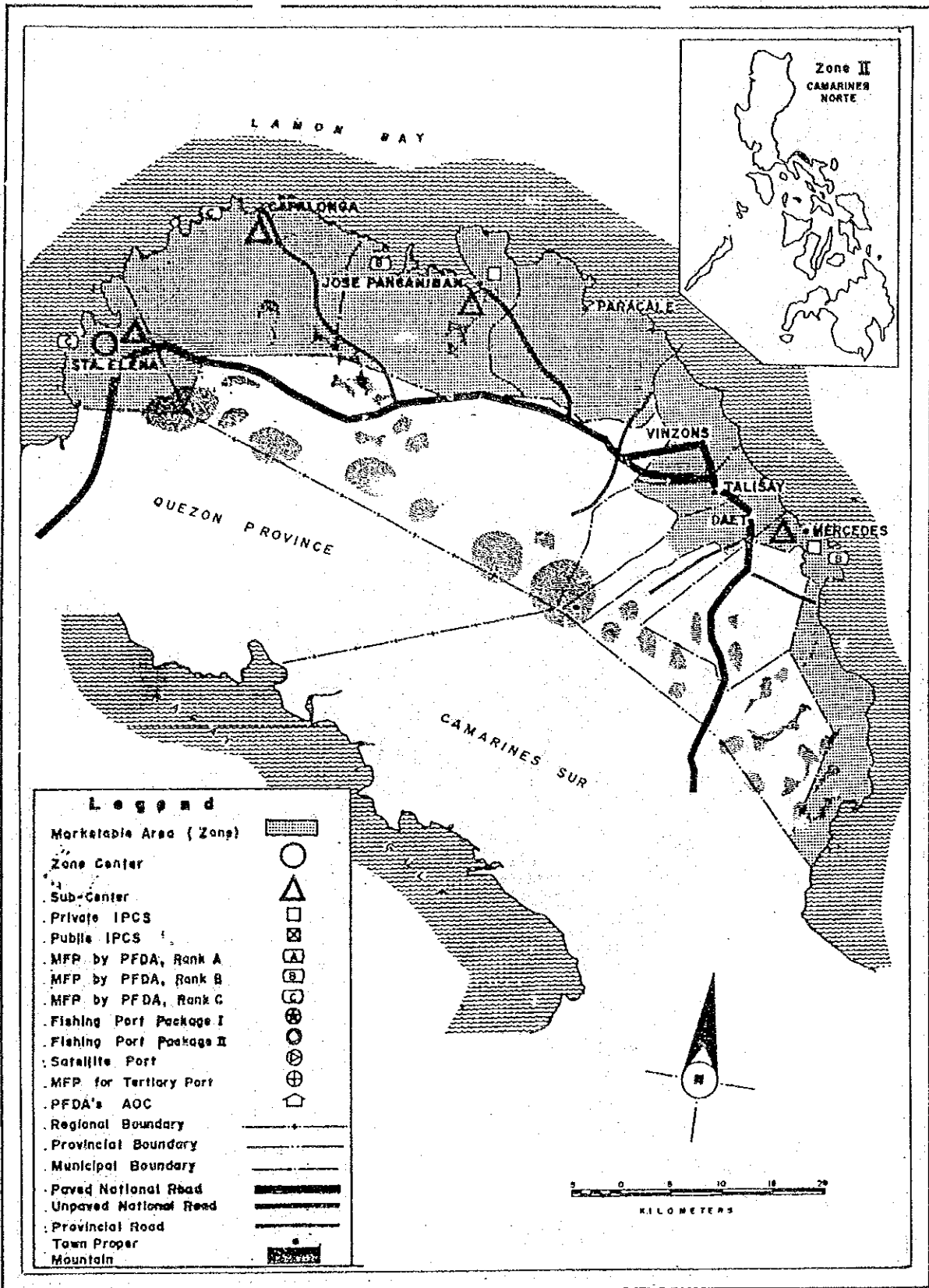


Fig.

ZONE II

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 THE STUDY OF MASTER PLAN FOR THE NATIONWIDE
 ICE PLANTS AND COLD STORAGE NETWORK SYSTEM
 JAPAN INTERNATIONAL COOPERATION AGENCY

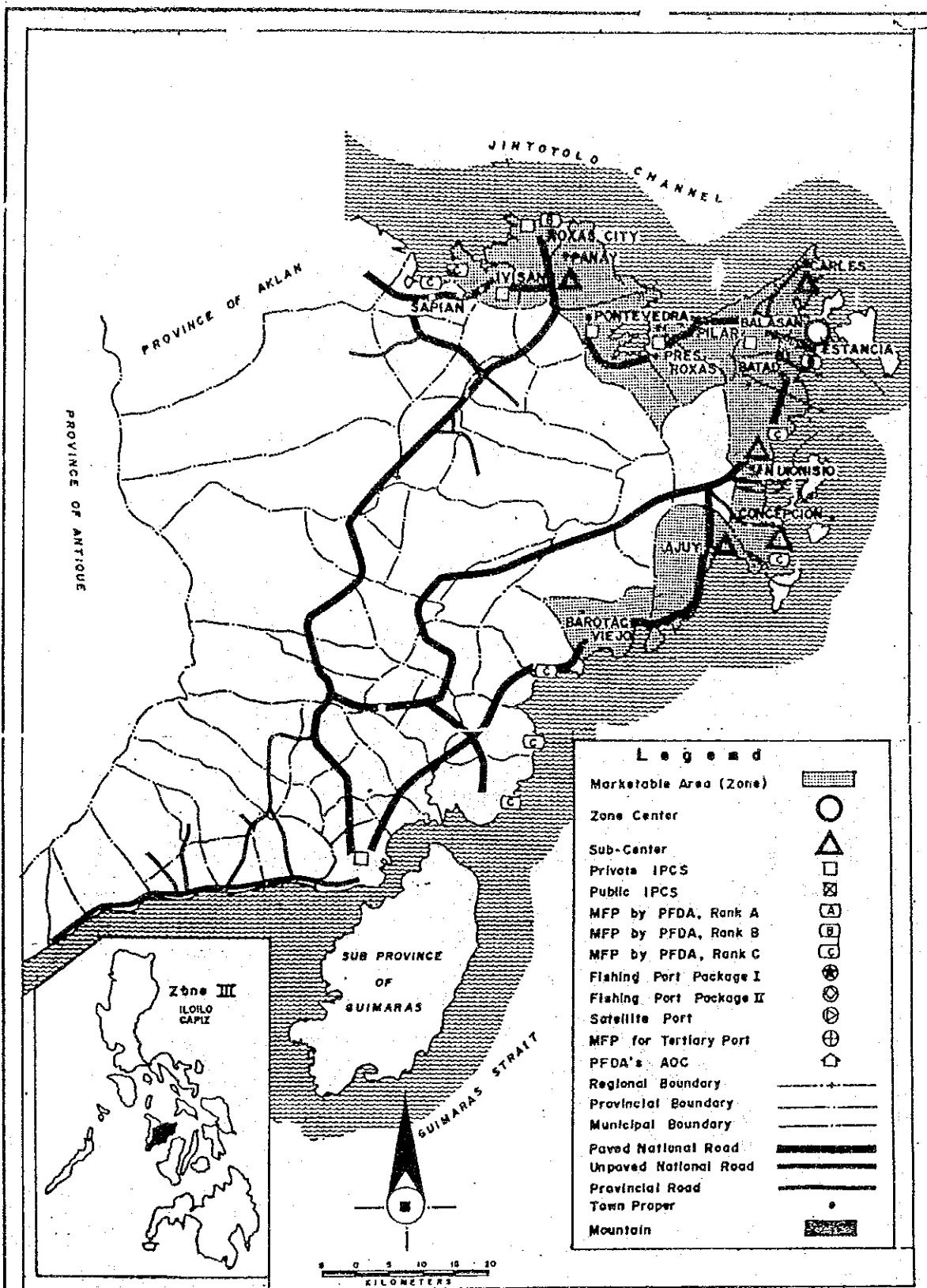


Fig. ZONE III

REPUBLIC OF THE PHILIPPINES
 THE STUDY OF MASTER PLAN FOR THE NATIONWIDE
 ICE PLANTS AND COLD STORAGES NETWORK SYSTEM
 JAPAN INTERNATIONAL COOPERATION AGENCY

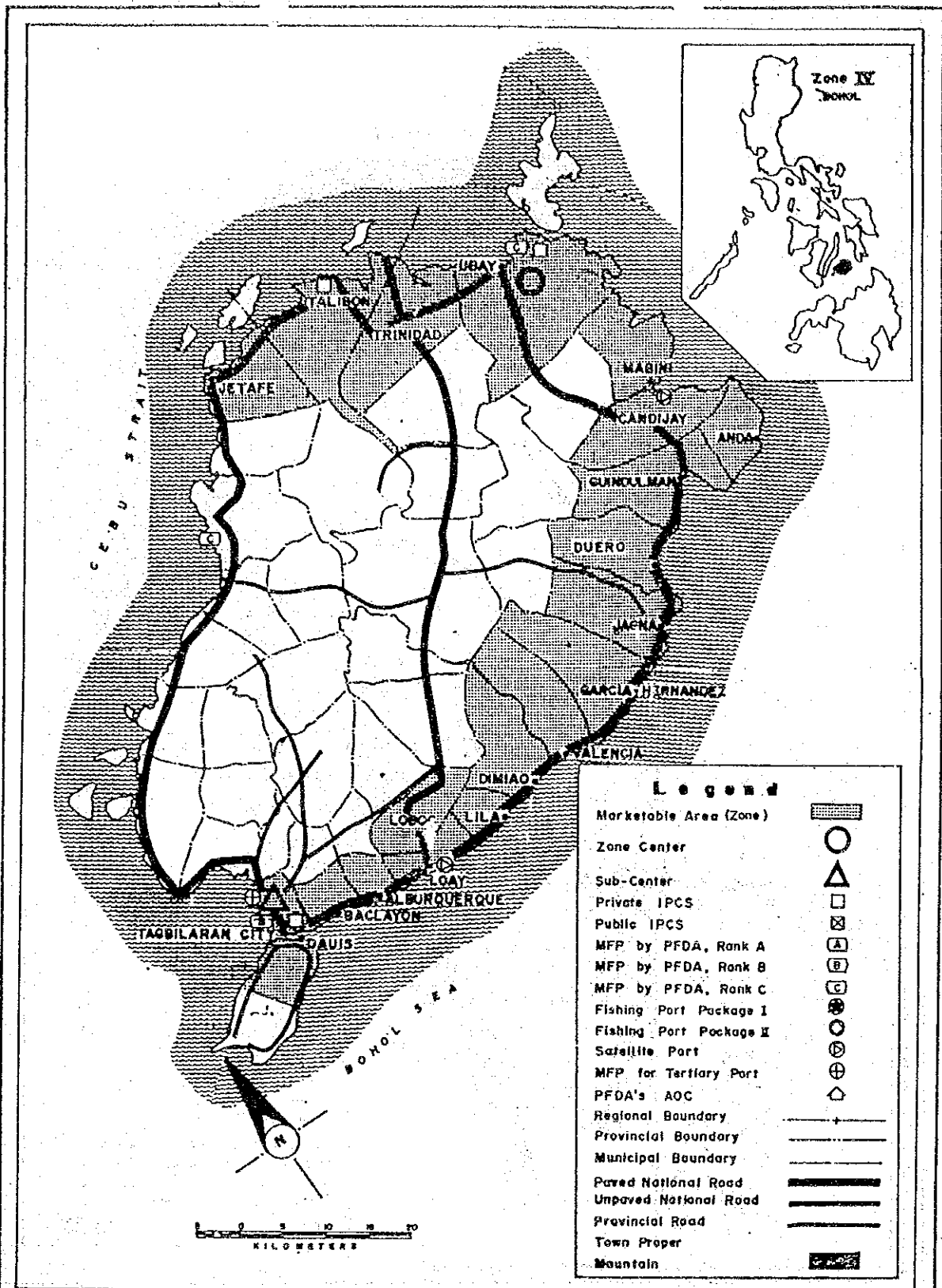


Fig. ZONE IV

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 THE STUDY OF MASTER PLAN FOR THE NATIONWIDE
 ICE PLANTS AND COLD STORAGE NETWORK SYSTEM
 JAPAN INTERNATIONAL COOPERATION AGENCY

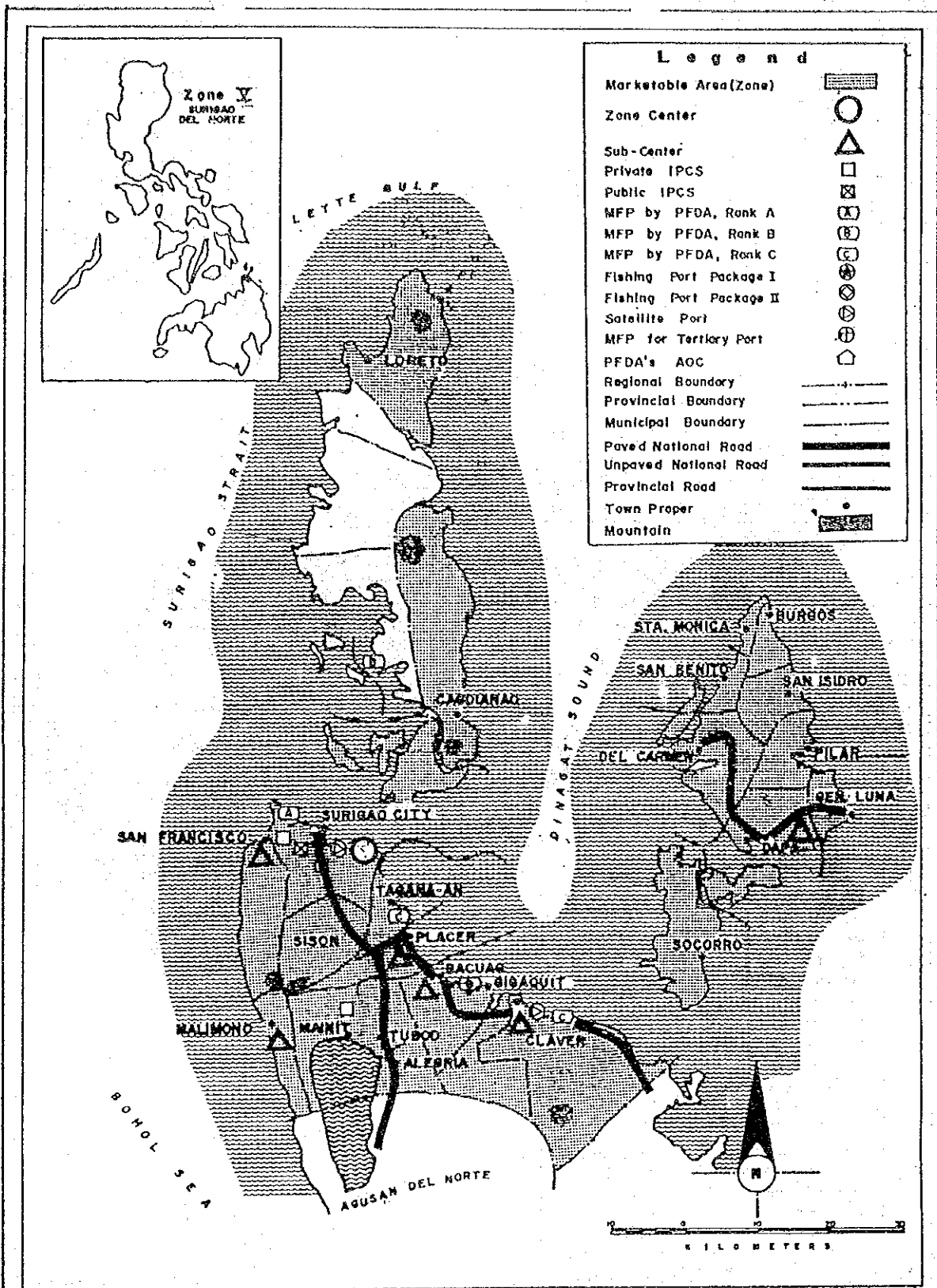


Fig. ZONE V

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THE STUDY OF MASTER PLAN FOR THE NATIONWIDE
ICE PLANTS AND COLD STORAGES NETWORK SYSTEM
JAPAN INTERNATIONAL COOPERATION AGENCY

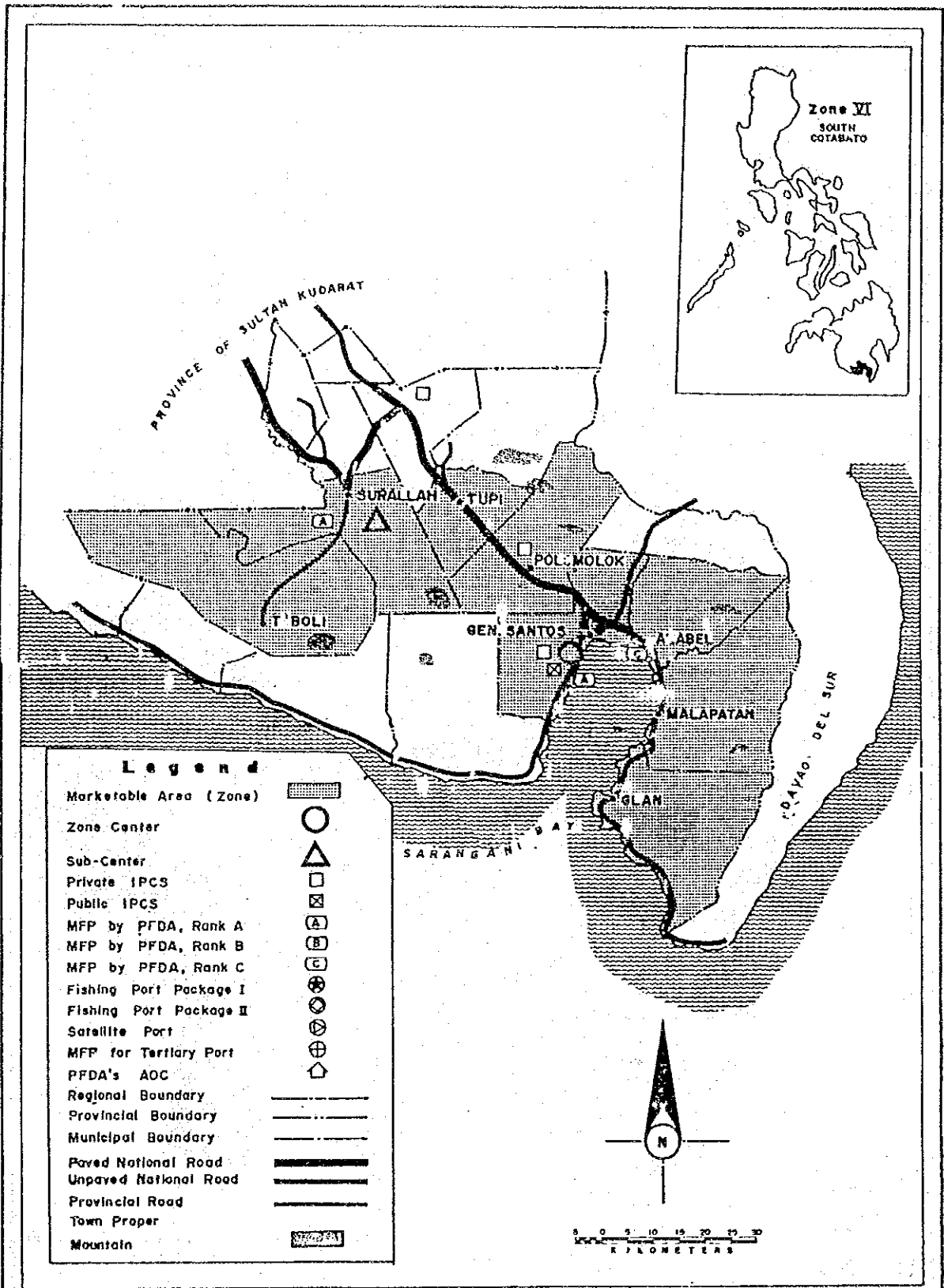


FIG. ZONE VI

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 THE STUDY OF MASTER PLAN FOR THE NATIONWIDE
 ICE PLANTS AND COOLING SYSTEMS
 JAPAN INTERNATIONAL COOPERATION AGENCY

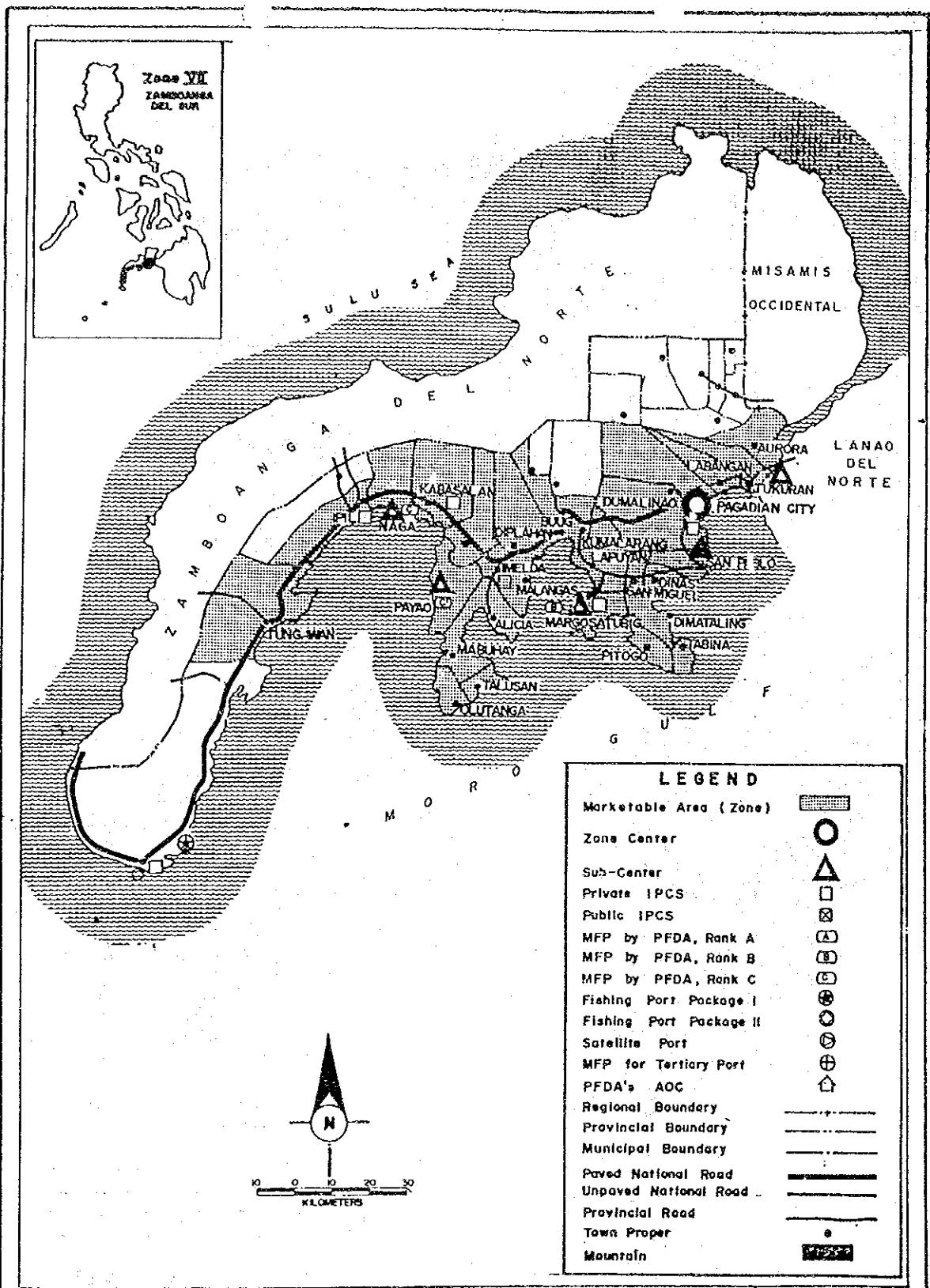


Fig. **ZONE VII**

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 THE STUDY OF MASTER PLAN FOR THE NATIONWIDE
 ICE PLANTS AND COLD STORAGES NETWORK SYSTEM
 JAPAN INTERNATIONAL COOPERATION AGENCY

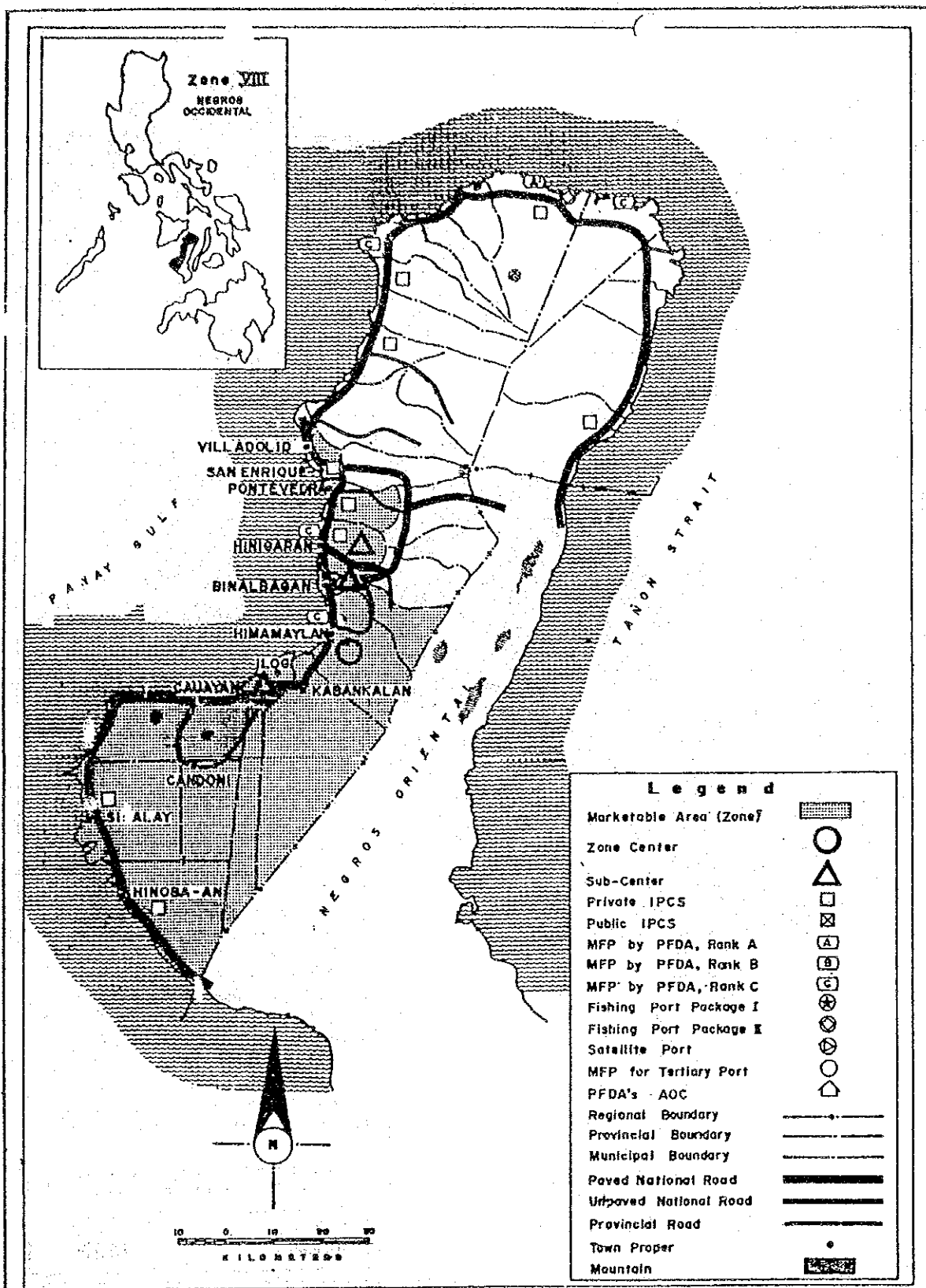
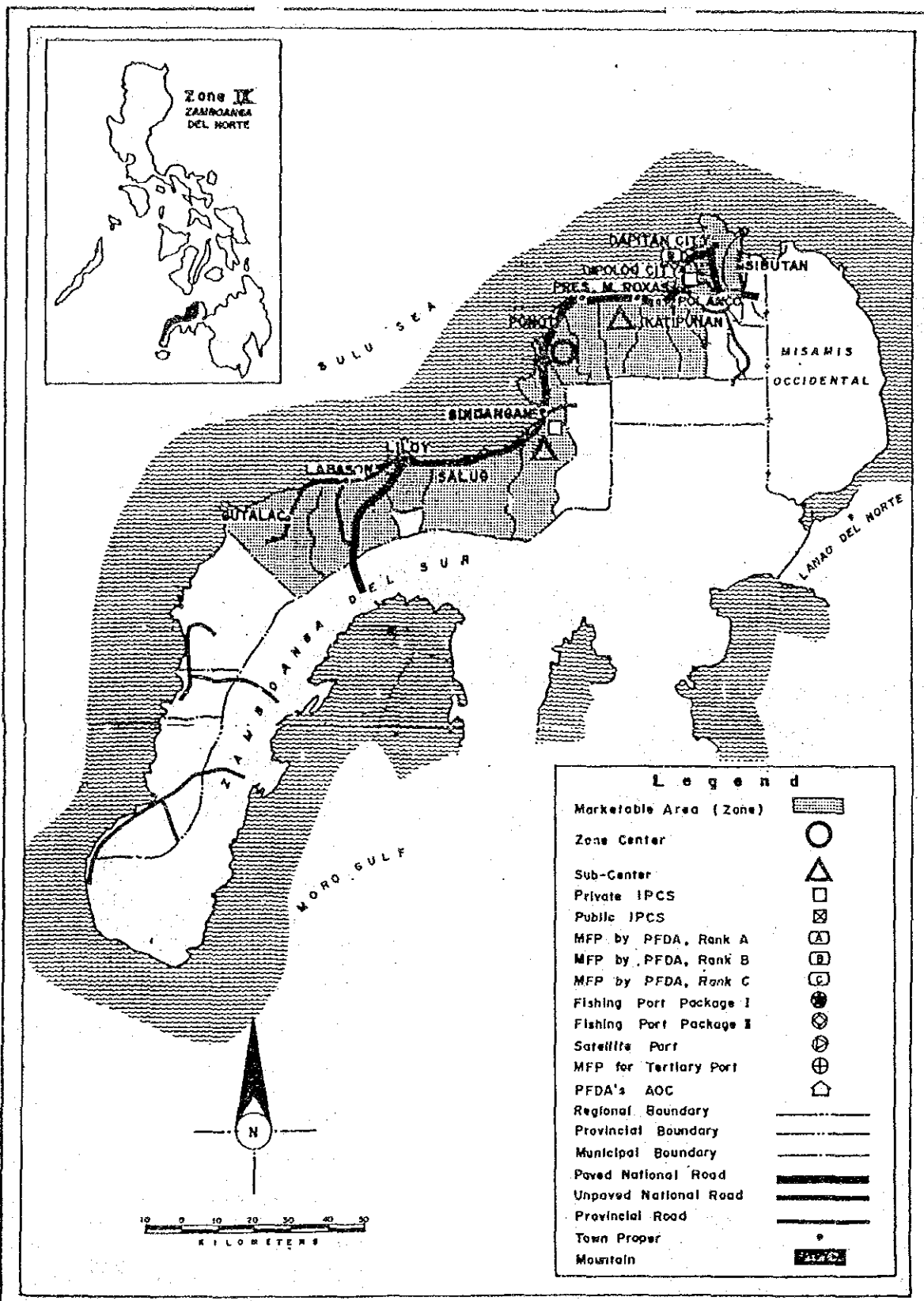


Fig. **ZONE VIII**

REPUBLIC OF THE PHILIPPINES
THE STUDY OF MASTER PLAN FOR THE NATIONWIDE
ICE PLANTS AND COLD STORAGES NETWORK SYSTEM
JAPAN INTERNATIONAL COOPERATION AGENCY



Legend

Marketable Area (Zone)	
Zone Center	
Sub-Center	
Private IPCS	
Public IPCS	
MFP by PFDA, Rank A	
MFP by PFDA, Rank B	
MFP by PFDA, Rank C	
Fishing Port Package I	
Fishing Port Package II	
Satellite Port	
MFP for Tertiary Port	
PFDA's AOC	
Regional Boundary	
Provincial Boundary	
Municipal Boundary	
Paved National Road	
Unpaved National Road	
Provincial Road	
Town Proper	
Mountain	

FIG. **ZONE IX.**

REPUBLIC OF THE PHILIPPINES
 THE STUDY OF MASTER PLAN FOR THE NATIONWIDE
 ICE PLANTS AND COLD STORAGES NETWORK SYSTEM
 JAPAN INTERNATIONAL COOPERATION AGENCY

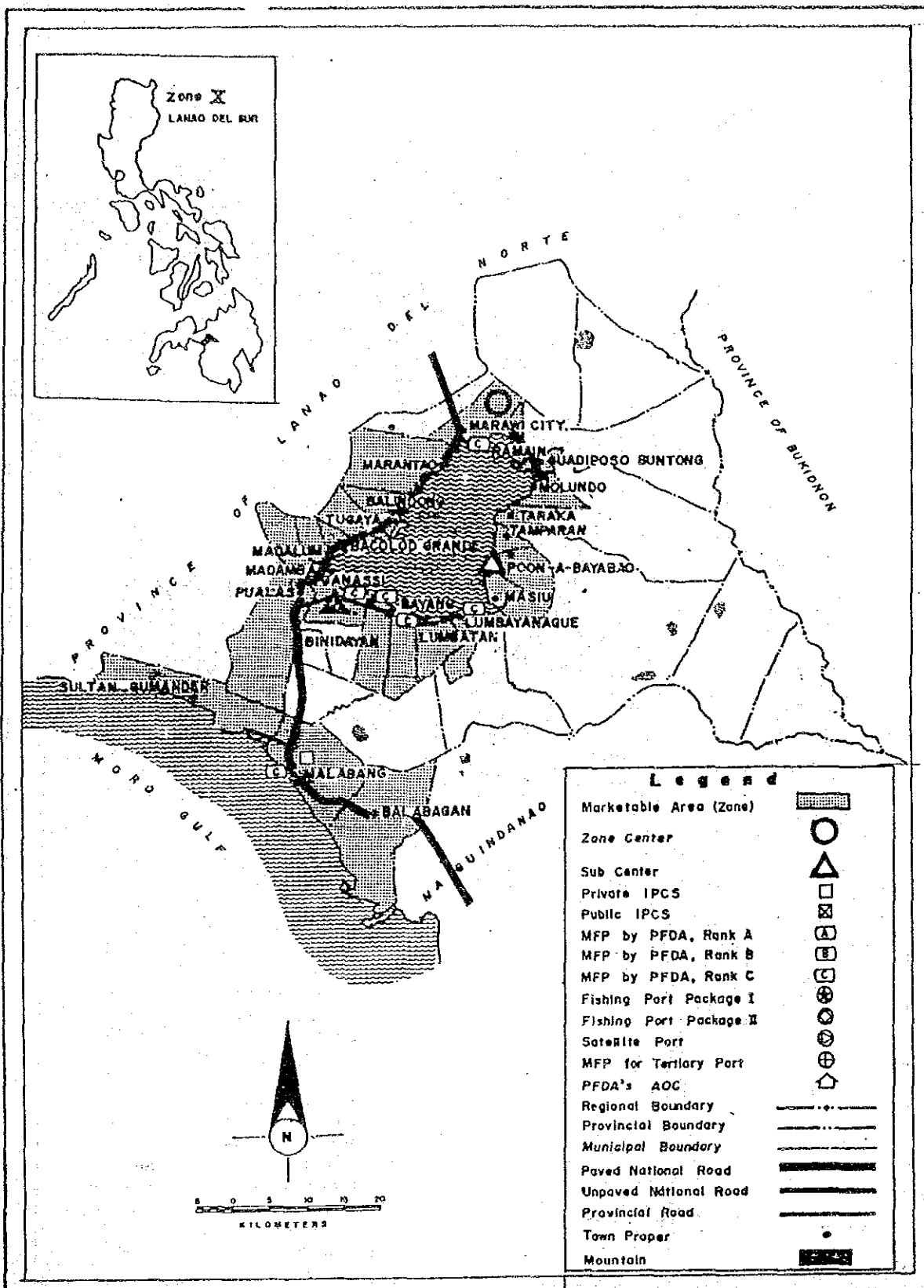


Fig.

ZONE X

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**THE STUDY OF MASTER PLAN FOR THE NATIONWIDE
 ICE PLANTS AND COLD STORAGES NETWORK SYSTEM**
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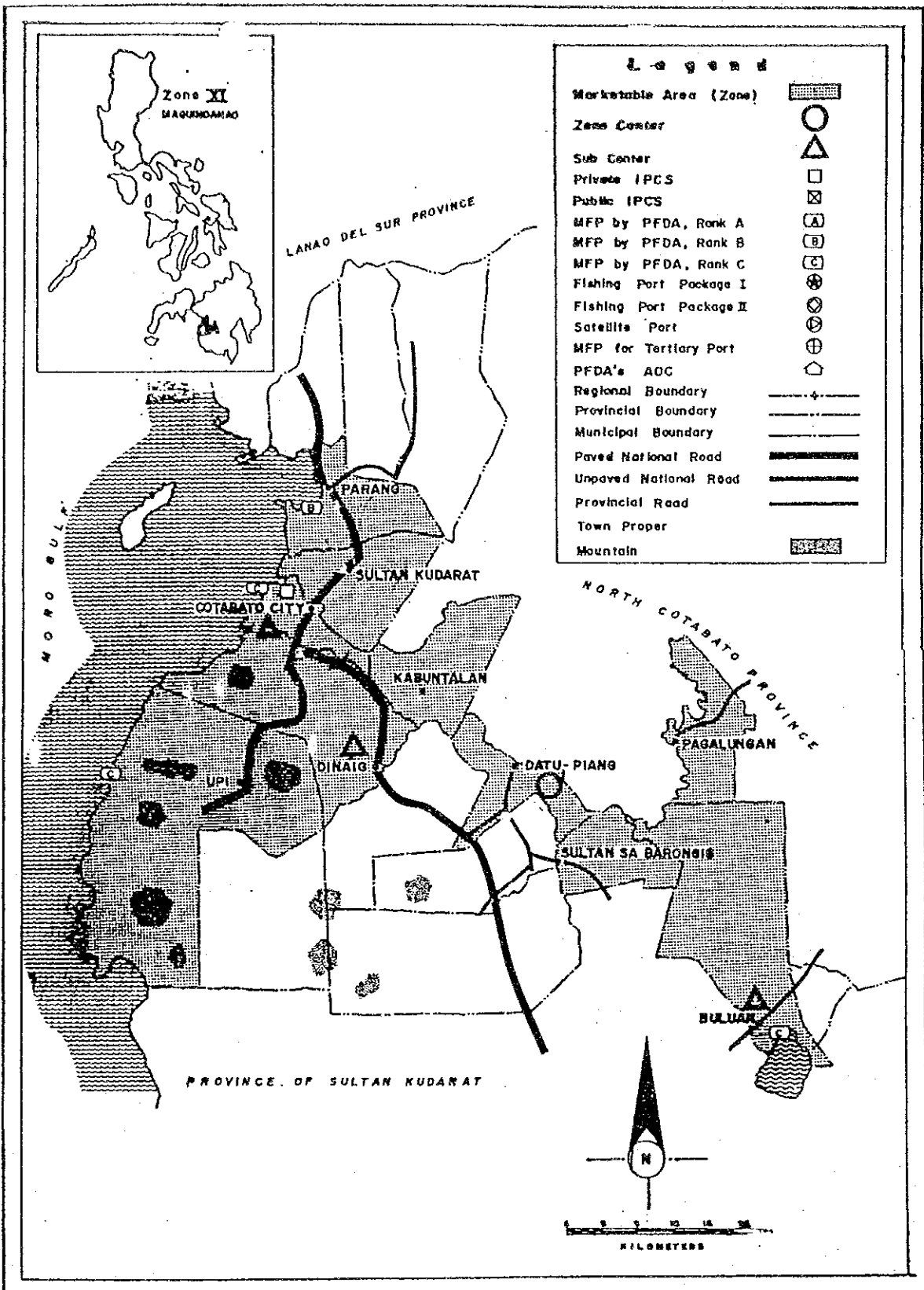


Fig. ZONE XI

REPUBLIC OF THE PHILIPPINES
THE STUDY OF MASTER PLAN FOR THE NATIONWIDE
ICE PLANTS AND COLD STORAGE NETWORK SYSTEM
JAPAN INTERNATIONAL COOPERATION AGENCY

JICA