additional plant is made. The ice supply/demand will be almost balanced in NCR but it is likely that the shortage will be more critical outside of Luzon by 2000.

The shortage 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.

6.2 Requirement of Cold Storages

(1) Government policy and present condition of cold storage

The development of cold storage is included in the support facility programs of IFDP to achieve optimum efficiency in fish marketing. IFDP provided general objectives for the marketing sector for 1980s as shown below in the order of priority:

(i) seasonal and geographical stablilization of fish supply

(ii) improved efficiency of marketing channels

(iii) reducing post-harvest losses

(iv) upgrading of product quality, and

(v) strengthening export market position.

In order to achieve the above objectives, the Government of the Philippines has established cold storages and started to operate them partly through NFPC, BFAR IPCS and Iloilo Fishing Port Complex under FPP I. But, the operational ratio of the existing cold storage is extremely low both in private and in public sectors, because of the people's little preference of frozen fish and the poor cold chain system linking fish production and consumption centers in the country.

However, in the future a certain amount of fish surplus which occurs during the peak season will be stored and marketed as frozen fish to meet the shortage of fish during the lean season, as there is a significant seasonal gap of supply and demand for fish and a possibility of people's increased inclination for frozen fish.

(2) Supply and demand balance of fish in 1983

According to the monthly supply and demand balance of fish in the country in 1983, based upon BFAR Statistics, fish surplus in domestic consumption was

estimated to be $120x10^3$ tons during the January -July period, while the deficit amounted to $-81x10^3$ tons during the August -December period.

It means that the surplus fish during the peak season should be stored in either frozen or processed form and consumed in the lean season.

(3) Requirements of cold storages for frozen fish in 2000

In view of the present condition a considerable time is required for the people to be accustomed to frozen fish and for the quality control system to be improved for the frozen fish export market.

Therefore, additional investment for cold storages will better be considered during the latter half of the project period.

Requirements of cold storages in 2000 for the fisheries sector were projected according to the following procedures:

a. Frozen fish for exports

$125x10^3$ tons of fresh fish were estimated as surplus or exportable as shown in Table 6.8, based on the projected supply and demand balance of fresh fish. Fresh fish for exports was projected by Region as shown in Table 6.9 based on fish production in marine oceanic commercial fisheries.

Frozen fish for exports was projected to be $119x10^3$ tons as shown in Table 6.12 accounting for 95% of exportable fish.

Exportable fish was projected to be $57x10^3$ tons in NCR, $32x10^3$ tons in Region IX and $15x10^3$ tons in Region XI. These 3 Regions together account for 87% of the total exportable fish in the country.

b. Frozen fish for domestic consumption

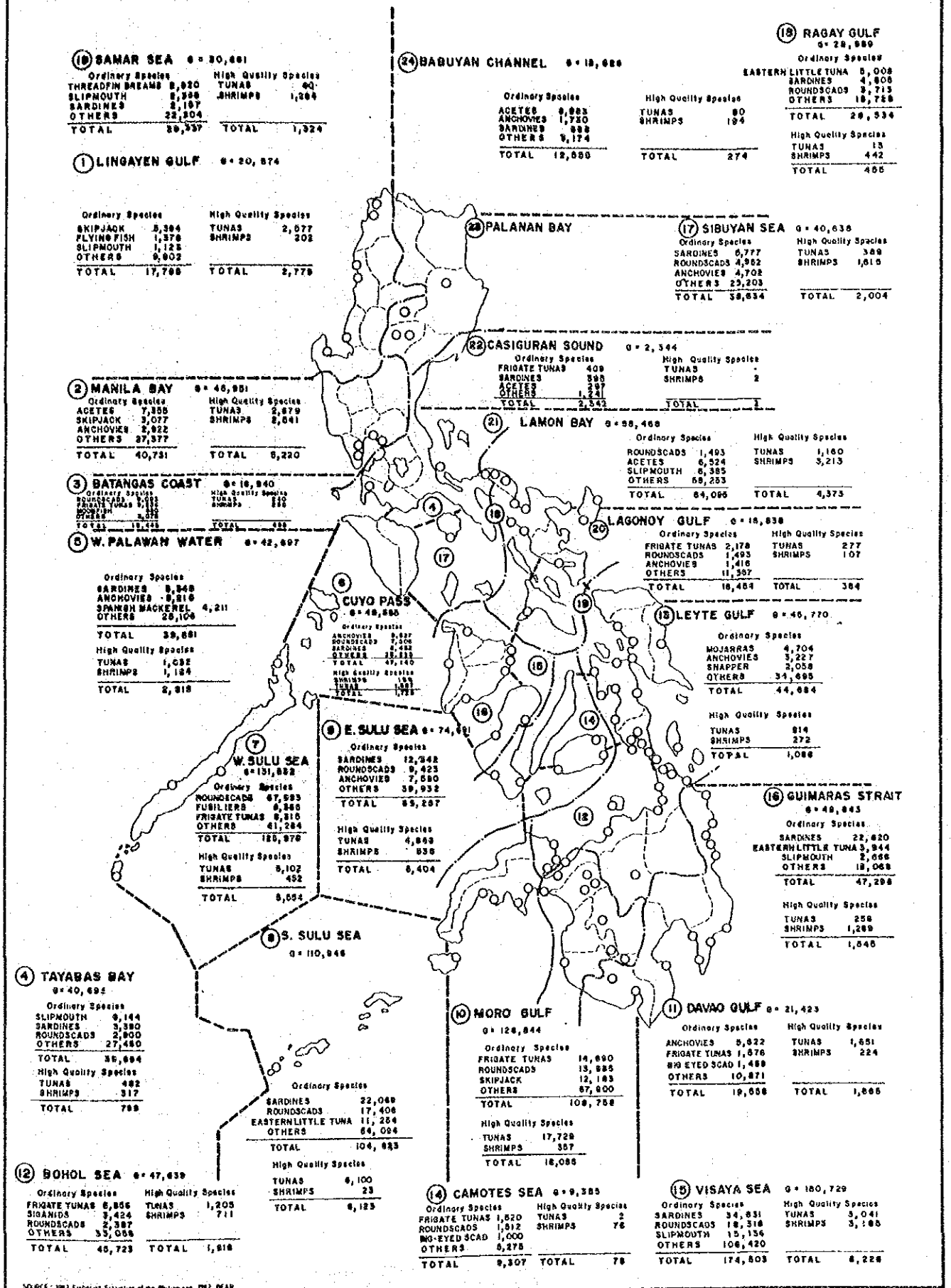
The amount of fish to be kept in cold storages was projected according to the following assumptions, based upon the supply and demand balance of fresh fish by Region as shown in Table 6.10.

(i) Surplus fresh fish is assumed to be distributed in fresh form to the deficit Regions in the country within the same month.

(ii) Surplus fish which can not be consumed in any Regions within the same month will be stored in cold storages for shipment in the fish deficit season, August to December.

The surplus and deficit situation of fresh fish by Region by month in 2000 were estimated and shown in Table 6.10 assuming no inter-Regional flow of fish and in Table 6.11 assuming inter-Regional flow of fish.

As shown in Table 6.12, frozen fish for domestic consumption was projected to be 16×10^3 tons in Region IV, 7×10^3 tons in Region V, 37×10^3 tons in Region VI and 74×10^3 tons in Region IX. Thus 134×10^3 tons of fish will be required for storage in frozen form in the country.



SOURCE : 1982 Fisheries Statistics of the Philippines, 1982, BFAR

Fig. 6.1 FISH PRODUCTION BY MAJOR SPECIES AND BY FISHING GROUND IN 1982

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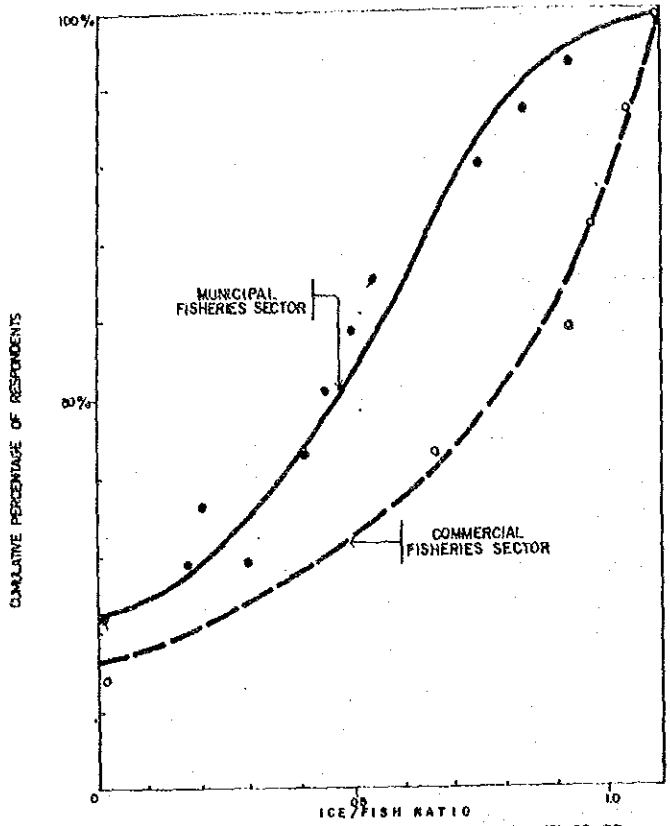
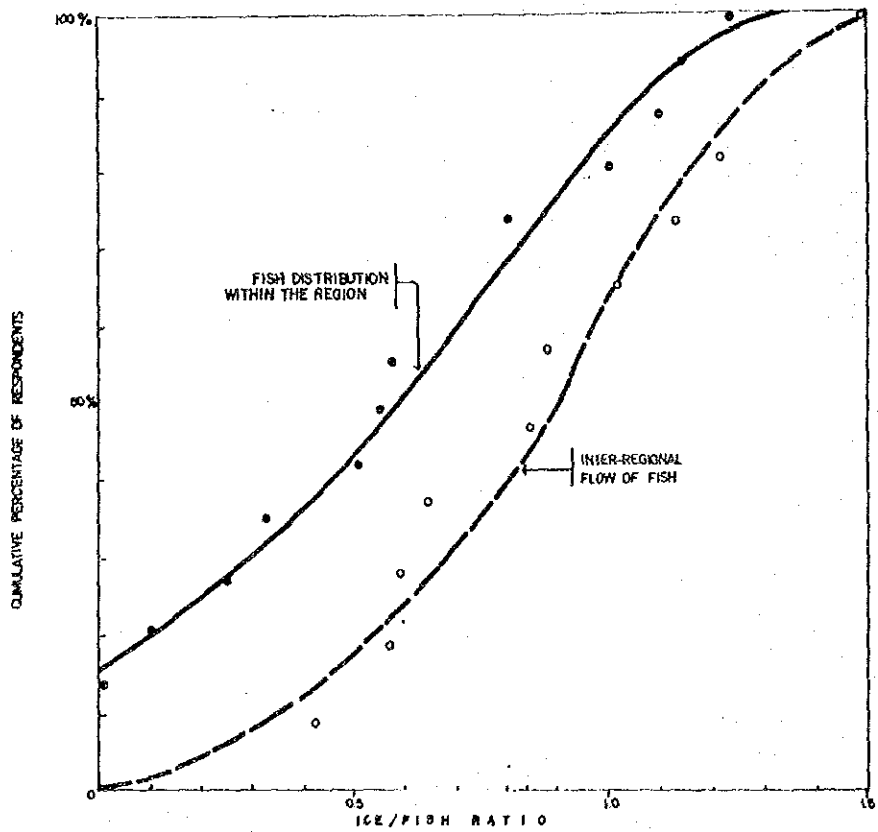


CUMULATIVE PERCENTAGE OF RESPONDENTS TO ICE/FISH RATIO IN CAPUTURE FISHING



CUMULATIVE PERCENTAGE OF RESPONDENTS TO ICE/FISH RATIO IN FISH MARKETING/TRANSPORTATION

SOURCE: Data was collected by the site inspection of the study

Fig. 6.2 CUMULATIVE PERCENTAGE OF RESPONDENTS TO ICE/FISH RATIO

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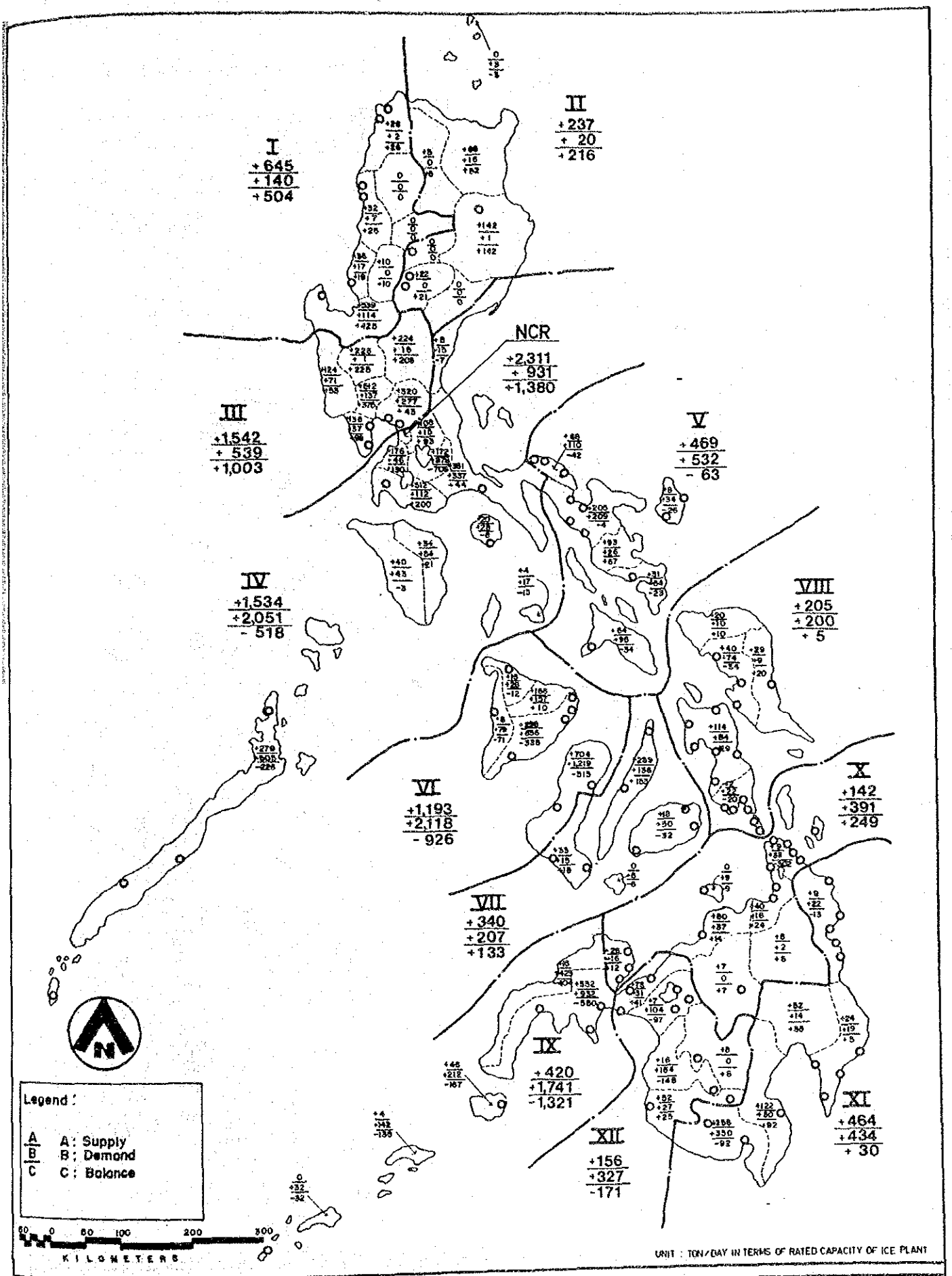

Fig. 6.3 SHORTAGE OF ICE FOR FISHERIES SECTOR, 1983

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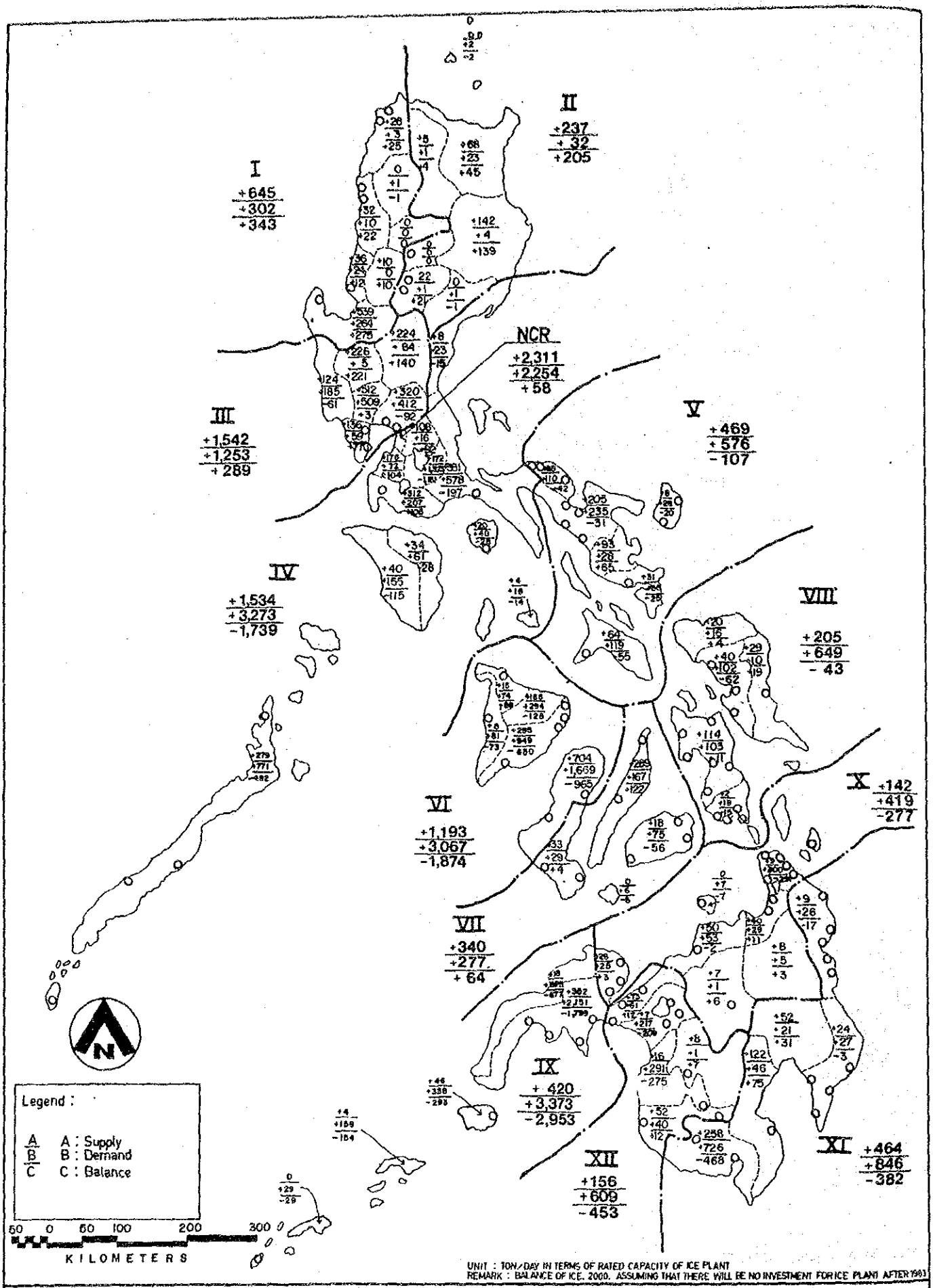

Fig. 6.4 SHORTAGE OF ICE FOR FISHERIES SECTOR, 2000

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JAPAN INTERNATIONAL COOPERATION AGENCY

Table 6.1 ICE/FISH RATIO IN FISHING FOR MARINE FISHERY

Region	Province	Serial No. of respondents	Municipality/ city	Fisheries sector	Duration of a trip	Ice/fish ratio
III	Bataan	1	Abucay (1)	Municipal	2 hrs. (fish carrier)	0.17
		2	Abucay (2)	Municipal	5 - 9 hrs.	0.53
	Bulacan	3	Hagonoy	Commercial	10 hrs.	1.01
V	Camarines Norte	4	J. Panganiban	Municipal	Peak 4 hrs. Lean 2 - 3 days	0 1.80
		5	Paracale	Municipal	1 day	0.81
		6	Sta. Elena	Municipal	10 - 12 hrs	1.10
		7	Capalonga	Municipal	Whole night or 3 - 5 hrs	0.20
VI	Iloilo	8	Banate	Municipal	7 hrs	0.55
		9	Conception	Municipal	5 - 6 hrs.	0.50
		10	Estancia (1)	Commercial	2 - 3 hrs. (fish carrier)	0.30
		11	Estancia (2)	Commercial	12 hrs.	0.65
		12	Estancia (3)	Municipal	6 hrs.	0.40
		13	San Dionicio	Municipal	4 hrs.	0
VII	Bohol	14	Balayan	Municipal	Whole night	0
		15	Tagbilaran	Commercial	12 hrs.	0.90
		16	Talibon	Municipal	4 hrs.	0.43
	Negros Oriental	17	Bayawan	Municipal	5 - 7 hrs.	0
		18	Dumaguete (1)	Commercial	2 - 10 hrs.	0
		19	Dumaguete (2)	Municipal	3 - 7 hrs.	0.73
XI	South Cotabato	20	Gen. Santos (1)	Commercial	18 hrs.	0.95
		21	Gen. Santos (2)	Municipal	up to 7 days	2.40
			Gen. Santos (3)	Commercial	24 hrs. (fish carrier)	1.08

Remark: Ice fish ratio is the ratio of ice in quantity to the quantity of fish for the preservation of fish.

Source: Interview through the field survey of the study team.

Table 6.2 ICE/FISH RATIO IN USE FOR HARVESTING OF MILK FISH CULTURE

	Site	Ice/Fish Ratio		Marketing Area
		For Harvesting	For Shipping	
1.	Abucay	0.3	0	A
2.	Hagonoy	0.3	0	A
3.	Sta. Elena	1.0	1.1	C
4.	Banate (1)	0.3	0	A
5.	Banate (2)	0.3	0.7	B
6.	Banate (3)	0.3	1.0	C
7.	Conception	0.5	0	B
8.	Estancia	0.4	0	B
9.	San Dionicio	0.4	0	B
10.	Talibon	0.3	0.3	B
11.	Tanjuy (1)	0.4	0	B
12.	Tanjuy (2)	0.4	1.0	C

Remarks: Marketing area A: Sold directly to fish dealers at the landing point.

B: Shipped to area within the same region.

C: Shipped to area outside the region.

Source: Interview through the field survey of the Study Team.

Table 6.3 ICE/FISH RATIO IN USE FOR MARKETING/TRANSPORTATION OF FISH

Region	Province	Municipality/ city	Serial No. of respondents	Time needed to ship to Marketing area: Within the Region	Time needed to ship to Marketing area: Outside of the Region	Ice fish ratio
III	Bataan	Balanga	1	1.5 - 5 hrs.	-	1.23
	Bulacan	Hagonoy	2	-	Manila (2 hrs.)	0.42
V	Camarine Norte	J. Panganiban	3	-	Malabon (10 hrs.)	0.64
		Paracale	4	-	Malabon (7 - 8 hrs.)	0.84
		Sta. Elena	5	-	Malabon (7 hrs.)	1.13
		Capalonga	6	Mainly 2 hrs.	-	0.42
				Storage to 4 days	-	0.84
VI	Iloilo	Banate	7	0.2 - 2 hrs.	-	1.13
		Conception (1)	8	0.2 - 4 hrs.	-	0.56
		Conception (2)	9	2 - 3 hrs.	-	1.01
		Estancia (1)	10	4 hrs.	-	0.68
		Estancia (2)	11	-	Manila (18 - 36 hrs.)	1.01
		San Dionicio	12	0.3 - 2.5 hrs.	-	1.10
VII	Bohol	Baclayon	13	0.3 hrs.	-	0
		Tagbilaran	14	1 - 3 hrs.	-	0
			15	-	Cagayan, Butuan (7-12 hrs.)	1.35
		Talibon	16	5 hrs.	-	0.50
			17	-	Cagayan (10 hrs.)	1.20
		Ubay	18	3 - 5 hrs.	-	0.70
	Negros Oriental	Dumaguete	19	0.3 - 1.5 hrs.	-	0
				Storage up to 3 days	-	1.00
				Cebu (8 hrs.)	-	1.25
			20	-	San Carlos (4.5 hrs.)	0.56
		Bayawan	21	2 hrs.		0
				Storage up to 3 days		0.97
XI	South Cotabato	Gen. Santos (1)	22	3 - 4 hrs.	-	0.81
			23	-	Butuan etc. (7 - 14 hrs.)	0.81
		Gen. Santos (2)	24	-	Japan via Davao	1.50
		Gen. Santos (3)	25	2 - 3 hrs.	-	0.10
				-	Bukidanon (7 hrs.)	0.59

Source: Interview-through the field survey of the Study Team

Table 6.4 FRESH FISH CONSUMPTION RATIO BY SPECIES

SPECIES	Fresh Fish Consumption Ratio (%)
Anchovy (Dilis)	26*
Berring (Tulis)	44*
Sardines (Tonsoy, Tamban)	48*
Other Sardine Group	50
Round Scad (Galonggong)	64*
Big-eyed Scad (Matangbaka)	74*
Cavalla (Talakitok)	93*
Mullet (Tanak, Aligasin)	94*
Other Jacks and Scad Group	90
Mackerels (Hasa-hasa, Alumahan)	82*
Frigate Tunas (Tulingan)	85
Tuna (Albacore)	91*
Bonito	93
Spanish Mackerel (Tangingi, Tanigue)	100
Other Mackerel and Tuna Group	90
Slipmouth (Sapsap)	74*
Nemipterid (Bisugo)	77*
Caesto (Dalagang Bukid)	92*
Siganid (Samaral)	92*
Sillago Whiting (Asohos)	92
Snapper (Maya-maya)	93*
Grouper (Lapu-lapu)	97*
Moon Fish (Chavita)	97*
Other Parch. bream and Snapper Group	95
Sharks and Rays (Pating, Pagi)	90
Acetes (Alamang)	0
Shrimps (Hipong Puti)	91*
Other Shrimp and Crab Group	100
Mollusks, except Shell Fish (Pusit, etc.)	97*
Milk Fish (Bangus)	88*
Tilapia	96*
Tiger Prawn (Sugpo)	100
Brackish Water Cultivate Species Total	90

Remarks: Ratios with * were quoted from Philippine Fish Marketing and Distribution Study, Vol. 2, 1975, BFAR. These for other species were modified by referring to those of similar species for which the ratios are available or information collected through field observation by the study team.

Table 6.5 FRESH FISH CONSUMPTION RATIO IN 1983 AND 2000

Unit: %

Region	1983	2000
NCR	70	94
I	86	96
II	59	71
III	84	88
IV	75	88
V	75	85
VI	79	87
VII	81	91
VIII	75	89
IX	69	83
X	74	84
XI	82	100
XII	79	91

Remarks: Fresh fish consumption ratio = Fresh fish consumption/Fish production

Source: (1) Fisheries Statistics of the Philippines, BFAR

(2) Philippine Fish Marketing and Distribution Study, 1975, BFAR

Table 6.6 RATED CAPACITY OF THE EXISTING ICE PLANTS AND COLD STORAGES IN 1983
– THOSE WHICH ARE OPERATED ONLY –

Region	Ice Plant (t/day)			Cold Storage (t)						Total
				For chilling			For freezing			
	Private Sector	Public Sector	Total	Private Sector	Public Sector	Sub-Total	Private Sector	Public Sector	Sub-Total	
N C R	5,503	0	5,503	59,763	0	59,763	57,365	0	57,365	117,128
I	806	0	806	2,578	0	2,578	-	0	-	2,578
II	296	0	296	508	0	508	-	0	-	508
III	1,927	0	1,927	9,737	0	9,737	-	0	-	9,737
IV	1,847	70	1,917	533	40	573	195	0	195	768
V	576	10	586	228	-	228	46	50	96	324
VI	1,491	0	1,491	150	0	150	67	0	67	217
VII	416	10	426	-	20	20	275	0	275	295
VIII	246	10	256	193	-	193	37	50	87	280
IX	515	10	525	58	20	78	145	0	145	223
X	178	0	178	195	0	193	226	0	226	421
XI	580	0	580	-	0	0	315	0	315	315
XII	195	0	195	60	0	60	-	0	-	60
Total	14,576 (99.3%)	110 (0.7%)	14,686 (100.0%)	74,003 (99.9%)	80 (0.1%)	74,083 (100.0%) (55.8%)	58,671 (99.8%)	100 (0.2%)	58,771 (100.0%) (44.2%)	132,854 (100.0%)

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 transfered from BFAR are only the existing operated plants among the public plants.

Source: (1) List of the Private Existing IPCS of APICSO in Metro Manila, January 1984, APICSO.

(2) List of the Private Existing IPCS of APICSO in Luzon, February 3, 1984 APICSO.

(3) List of Private Existing IPCS of APICSO, May 1984, APICSO.

(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 1984, MPWH.

(10) Pangasinan Fishing Port Network, Update studies, August 1984, MPWH.

(11) Comparison of Refrigeration Facilities (Iloilo, Sual, Lucena, Camaligan and Zamboanga), 1982 and 1983, MPWH.

(12) Northern Palawan Fisheries Development Project (ADB).

Table 6.7 SHORTAGE OF ICE PLANT FOR FISHERY SECTOR BY REGION IN 1983, 1990 AND 2000

Unit: tons/Day

	1983			1990			2000		
	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) Shortage of ice plant was projected in case there was no increase of the plant after 1983.

(2) S: Rated capacity of existing ice plants to supply ice to fishery sector (t/day) Ice sold to fishery sector out of the total ice produced is assumed to be 42% for NCR and 80% for the rest of regions. And S was estimated as the rated capacity of existing ice plant, 1982, as given in Table 6.6.

(3) D: Demand for rated capacity of ice plants in fishery/sector.

(i) Ice requirement for fishing/harvesting = Fish production x Ice/fish ratio (t/yr) as given in Table 6.1, 6.2 and 6.3.

(ii) Ice requirement for fish transport/marketing = Surplus of fresh fish x Ice/fish ratio (t/yr)

(iii) Conversion factors from ice to rated capacity of ice plant are 300 operational days x 50% operational ratio.

(4) S-D: This figure will indicate the requirement of additional ice plants for fishery sector in terms of the rated capacity.

(5) Ice fish ratios were established by refering to those which are most popularly found in Table 6.1, 6.2 and 6.3.

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.

Table 6.8 DIFFERENCE BETWEEN PRODUCTION OF AND DOMESTIC DEMAND FOR FRESH FISH BY REGION BY MONTH IN 2000 WITHOUT INTER-REGIONAL FLOW OF FISH

Unit: 10^3 tons

Region	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
NCR	-1	-5	+3	+13	+9	+2	+2	-5	-6	-7	-12	-15	-22
I-III	-13	-13	-14	-16	-12	-13	-15	-16	-20	-18	-19	-19	-188
IV	+14	+15	+13	+11	+19	+25	+12	+12	+5	+5	-0	+3	+134
V	-2	-1	-3	+4	+2	+1	-2	-3	-5	-4	-5	-6	-24
VI	+29	+24	+16	+21	+20	+20	+31	+15	+17	+14	+5	+3	+215
VII	-9	-8	-7	-9	-9	-8	-7	-7	-8	-7	-9	-9	-97
VIII	-5	-5	-4	-5	-4	-3	-4	-4	-5	-3	-5	-5	-52
IX	+16	+27	+30	+19	+27	+24	+23	+21	+22	+19	+18	+17	+263
X	-4	-2	-4	-3	-2	-5	-5	-4	-5	-5	-6	-7	-52
XI	-7	-5	-5	-8	-3	-6	-6	-4	-3	-1	-2	-4	-54
XII	-0	-3	-2	+5	+1	+1	+1	+1	-1	+0	+0	-1	+2
TOTAL	+18	+24	+23	+32	+48	+38	+30	+6	-9	-7	-35	-43	+125

Remarks: (1) Volume of this Table shows fish surplus (+) and deficit (-) after deducting domestic fish demand by Region by month from fish production.

(2) Volume of fish production and domestic demand is tabulated only for fresh fish excluding those of processed fish.

(3) Grand total of 125 x 10^3 tons corresponds to volume of exportable fish mainly composed of tuna and skipjack.

Table 6.9 EXPORTABLE FRESH FISH BY REGION BY MONTH IN 2000

Unit: 10^3 tons

Region	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
NCR	5	4	6	8	7	6	6	4	4	4	3	3	60
I-III	0	0	0	1	0	1	1	0	0	1	1	0	5
IV	0	0	0	0	0	0	0	0	0	0	0	0	0
V	0	0	0	0	0	0	0	0	0	0	0	0	0
VI	1	0	1	1	1	0	0	0	1	1	0	0	6
VII	0	1	1	0	1	0	1	0	0	1	0	0	5
VIII	0	0	0	0	0	0	0	0	0	0	0	0	0
IX	2	2	3	2	4	3	3	3	4	2	3	2	33
X	0	0	0	0	0	0	0	0	0	0	0	0	0
XI	1	1	1	1	1	1	1	1	2	2	2	2	16
XII	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	9	8	12	13	14	11	12	8	11	11	9	7	125

Remarks; (1) Exportable fresh fish is composed of live and frozen fish.

(2) This matrix table was formed by dividing the grand total of exportable fish, 125 x 10^3 tons into each element. Proportion of each element was estimated based on the actual distribution of fish production in oceanic commercial fisheries sector, in which major kinds of fish are tuna/ skipjack.

Table 6.10 DIFFERENCE BETWEEN PRODUCTION OF AND DOMESTIC DEMAND FOR FRESH FISH BY REGION BY MONTH IN 2000 EXCEPT FOR EXPORT WITHOUT INTER-REGIONAL FLOW OF FISH

Unit: 10^3 tons

Region	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
NCR	-6	-9	-3	+5	+2	-4	-4	-9	-10	-11	-15	-18	-82
I-III	-13	-13	-14	-17	-12	-14	-16	-16	-20	-19	-20	-19	-193
IV	+14	+15	+13	+11	+19	+25	+12	+12	+5	+5	-0	+3	+134
V	-2	-1	-3	+4	+2	+1	-2	-3	-5	-4	-5	-6	-24
VI	+28	+24	+15	+20	+19	+20	+31	+15	+16	+13	+5	+3	+209
VII	-9	-9	-8	-9	-10	-8	-8	-7	-9	-7	-9	-9	-102
VIII	-5	-5	-4	-5	-4	-3	-4	-4	-5	-3	-5	-5	-52
IX	+14	+25	+27	+17	+23	+21	+20	+18	+18	+17	+15	+15	+230
X	-4	-2	-4	-3	-2	-5	-5	-4	-5	-5	-6	-7	-52
XI	-8	-6	-6	-9	-4	-7	-7	-5	-5	-3	-4	-6	-70
XII	-0	-3	-2	+5	+1	+1	+1	+1	-1	+0	+0	-1	+2
TOTAL	+9	+16	+11	+19	+34	+27	+18	-2	-21	-17	-44	-50	0

Remarks: This matrix table was formed by deducting volumes estimated in Table 6.9 from those in Table 6.8.

Table 6.11 DIFFERENCE BETWEEN PRODUCTION OF AND DOMESTIC DEMAND FOR FRESH FISH BY REGION BY MONTH IN 2000 EXCEPT FOR EXPORT WITH INTER-REGIONAL FLOW OF FISH

Unit: 10^3 tons

Region	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
NCR	0	0	0	0	0	0	0	0	0	0	-11	-14	-25
I-III	0	0	0	0	0	0	0	0	-18	-16	-19	-19	-72
IV	0	0	0	0	+9	+7	0	0	0	0	0	0	+16
V	0	0	0	+4	+2	+1	0	-2	-2	0	0	-3	0
VI	+7	+2	0	+5	+5	+9	+9	0	0	0	0	0	+37
VII	0	0	0	0	0	0	0	0	-1	-1	-9	-9	-20
VIII	0	0	0	0	0	0	0	0	0	0	-5	-5	-10
IX	+2	+14	+11	+10	+18	+10	+9	0	0	0	0	0	+74
X	0	0	0	0	0	0	0	0	0	0	0	0	0
XI	0	0	0	0	0	0	0	0	0	0	0	0	0
XII	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	+9	+16	+11	+19	+34	+27	+18	-2	-21	-17	-44	-50	0

Remarks: Volume in this Table was estimated assuming that fish was distributable from surplus to deficit Regions within the same month.

Table 6.12 VOLUMES OF FROZEN FISH BY REGION IN 2000

Unit: 10^3 tons

Region	A	Exportable Fresh Fish			D	E	F
		Total B	Frozen C	Live B-C			
NCR	-22	60	57	3	-82	0	57
I	-91	0	0	0	-91	0	0
II	-69	0	0	0	-69	0	0
III	-28	5	5	0	-33	0	5
IV	+134	0	0	0	+134	16	16
V	-24	0	0	0	-24	7	7
VI	+215	6	6	0	+209	37	43
VII	-97	5	4	1	-102	0	4
VIII	-52	0	0	0	-52	0	0
IX	+263	33	32	1	+230	74	106
X	-52	0	0	0	-52	0	0
XI	-54	16	15	1	-70	0	15
XII	+2	0	0	0	+2	0	0
TOTAL	+125	125	119	6	0	134	253

Remarks:

A; Difference between production of and domestic demand for fresh fish by Region in 2000 without inter-Regional flow of fish (Table 6.8)

B; Exportable fresh fish by Region in 2000 (Table 6.9)

C; Frozen fish for export accounts for 95% of exportable fresh fish in 1981 and 1982 based on BEAR Statistics.

D; Difference between production of and domestic demand for fresh fish by Region in 2000, except for export, without inter-Regional flow of fish (Table 6.10)

E; Difference between production of and domestic demand for fresh fish by Region in 2000, except for export, with inter-Regional flow of fish (Table 6.11)

F; (C + E) Volumes of Frozen fish by Region in 2000

7. SELECTION OF PRIORITY AREAS

7. SELECTION OF PRIORITY AREAS

7.1 Basic Principles followed for the Selection of Priority Areas

For the economy of the operation of IPCS as pointed out in Chapter 4 many of IPCS sites proposed by PFDA are grouped into several zones, in order that each zone may have a center with an ice plant and several sub-centers with ice storages only. Both the center and sub-centers correspond more or less to the proposed IPCS sites. For the remaining proposed IPCS sites which are located outside the zones, independent prototype ice plants are distributed according to the necessity. The former is called "zone system" and the latter "prototype system" in this report.

Selection of areas for the zone system and sites for the prototype system was done for the project area, which excludes the areas covered by NFPC, FPP I/II, NPFDP and NFDP projects. Priority provinces were determined according to such criteria as the extent of shortage of ice plants, the scope of ice marketable area, the degree of internal transportation system developed and so on. In principle, a zone was formed for the area of each priority province so determined. However, some of neighbouring provinces were grouped so as to trade them a single zone.

7.2 Establishment of Priority Zones

Priority zones were established according to the following three steps:

(1) Identification of priority provinces by ice shortage

Priority provinces were identified based upon the following criteria:

a. Shortage of ice plants in 2000

The shortage of ice plants corresponds to the ice balance between the ice supply and demand assuming no additional investment is made after 1983. The balance of fish/ice by province is shown in Figs. 5.1, 6.3 and 6.4.

The lowest limit of the financial viability is considered to be around 5 tons/day of the rated capacity of the ice plant according to the preliminary evaluation during Phase I study, based on 300 operational days and 50% of operational ratio. According to the Government policy in the Revised Five-Year Plan, it is assumed that the government sector would contribute 20% to the

total investment of the construction sector in the country, the remaining 80% being covered by the private sector. Priority provinces were identified as those in which the deficiency in ice plant capacity would be more than 25 tons/day, 5 tons/day being met by public ice plants and 20 tons/day by private ice plants.

b. Market area to be covered by zone system

Laguna province was excluded from the selected priority provinces because it is supplied with ice from Metro Manila, which is only within 1 to 2 hours distance, even though Laguna is the biggest fish production area in inland fisheries in the country and the ice demand is extremely high.

22 priority provinces based on these criteria are listed in Table 7.1.

(2) Determination of priority provinces

Priority provinces were determined from among the identified provinces in (1) considering the following factors:

a. Duplication with other national projects

Several provinces were excluded from the priority provinces for the IPCS zone system, considering the duplication with national projects as follows:

(i) Quezon with FPP I.

(ii) Regional Fishing Ports are planned or constructed under FPP I and II in Zamboanga del Sur, Iloilo and Negros Occidental. However, these provinces are still retained as potential priority provinces, as the rural areas of these provinces are not primarily served by these Regional Fishing Ports.

(iii) Palawan served by NPFDP assisted by ADB.

(iv) Oriental Mindoro, Occidental Mindoro and Antique which are served by the existing PFDA plants and for which no sites were proposed by PFDA.

b. Small market area

Among the above selected provinces, Marinduque, Aklan, Basilan and Sulu

were excluded because of their marginal market arising from their isolated locations.

c. Transportation constraints between the proposed sites

The proposed sites in Palawan are not well connected with each other, because of poor road conditions. These sites are not suitable for integration into a zone.

As a result of the above-mentioned approaches, the following 13 provinces were determined as priority provinces to be served by the zone system:

(i) Bulacan
ii) Zambales
(iii) Camarines Norte
(iv) Iloilo
(v) Capiz
(vi) Negros Occidental
(vii) Bohol
(viii) Zambonga del Norte
(ix) Zombonga del Sur
(x) Surigao del Norte
(xi) South Cotabato
(xii) Lanao del Sur
(xiii) Maguindanao

(3) Formulation of priority zones

Priority zones were formulated by identifying the municipalities in the 13 selected priority provinces and their adjacent area.

Municipalities included in the zone were selected based on the following major factors:

a. Municipalities in which fish landings in 2000 will be 1,000 tons or more.

b. Municipalities in which fish supply will be over fish demand in 2000.

c. Physical constraints such as mountains, rivers and other transportation constraints.

d. Linkage among the municipalities

Priority zones and zone boundaries are shown in Figs. 7.1 to 7.11.

7.3 Selection of prototype Sites

Among the sites not covered by the zone system, those, to which the prototype ice plant is to be built were selected, considering the following factors:

(i) Fish landings in 2000

(ii) Major species of fish in accessible marine fishing grounds

(iii) Fishpond production in 2000

(iv) Ice shortage in 2000

(v) Presence of ice plants in 1983

(vi) Accessibility to national roads and road surface conditions

These 52 prototype sites were selected from 101 sites proposed by PFDA as potential sites for the introduction of the IPCS prototype system as shown in Table 7.2. Out of 52 sites, however, four (4) sites will be grouped and served by one mobile plant.

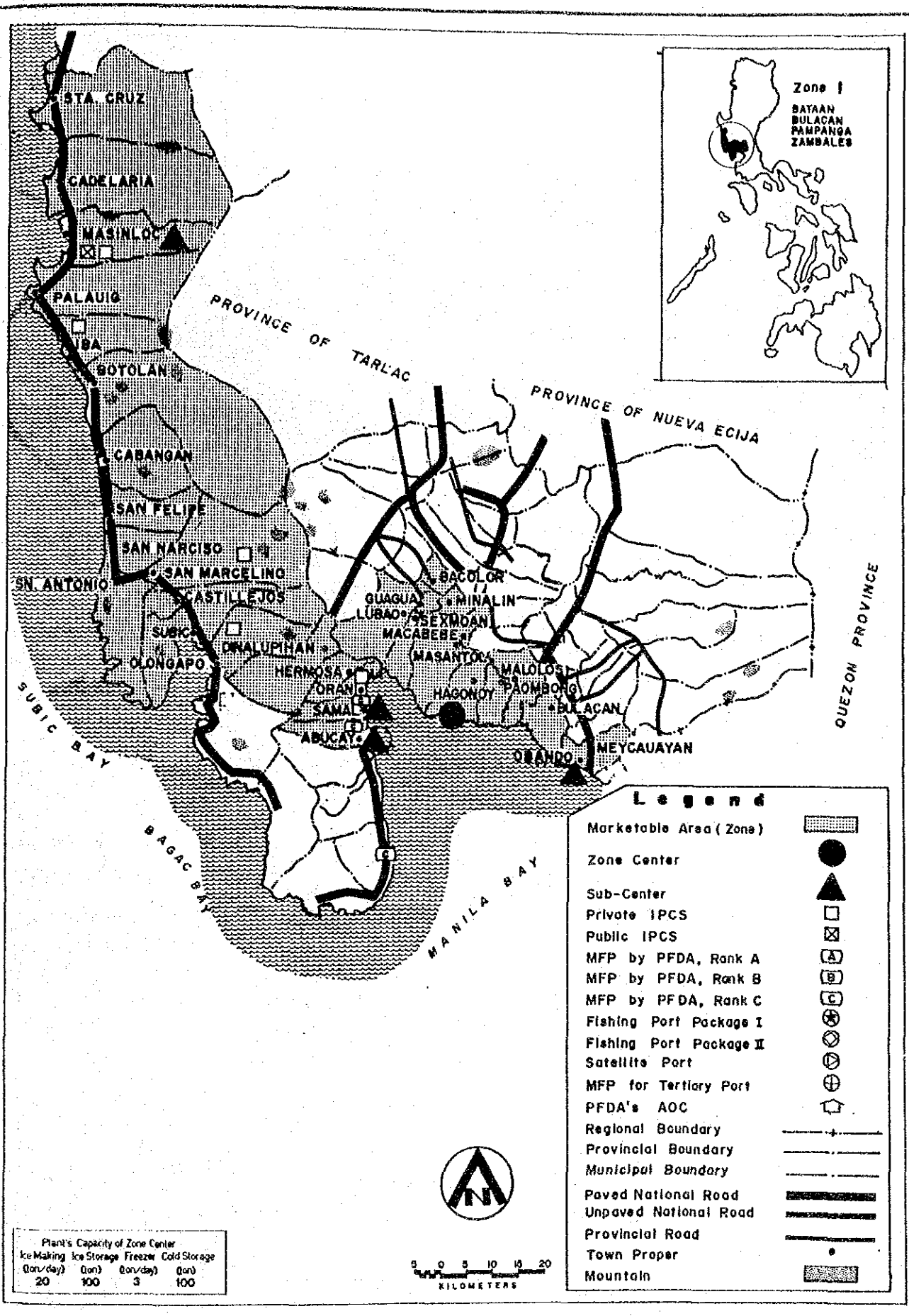

Fig. 7.1 LOCATION OF ZONE CENTER AND SUBCENTERS, ZONE 1

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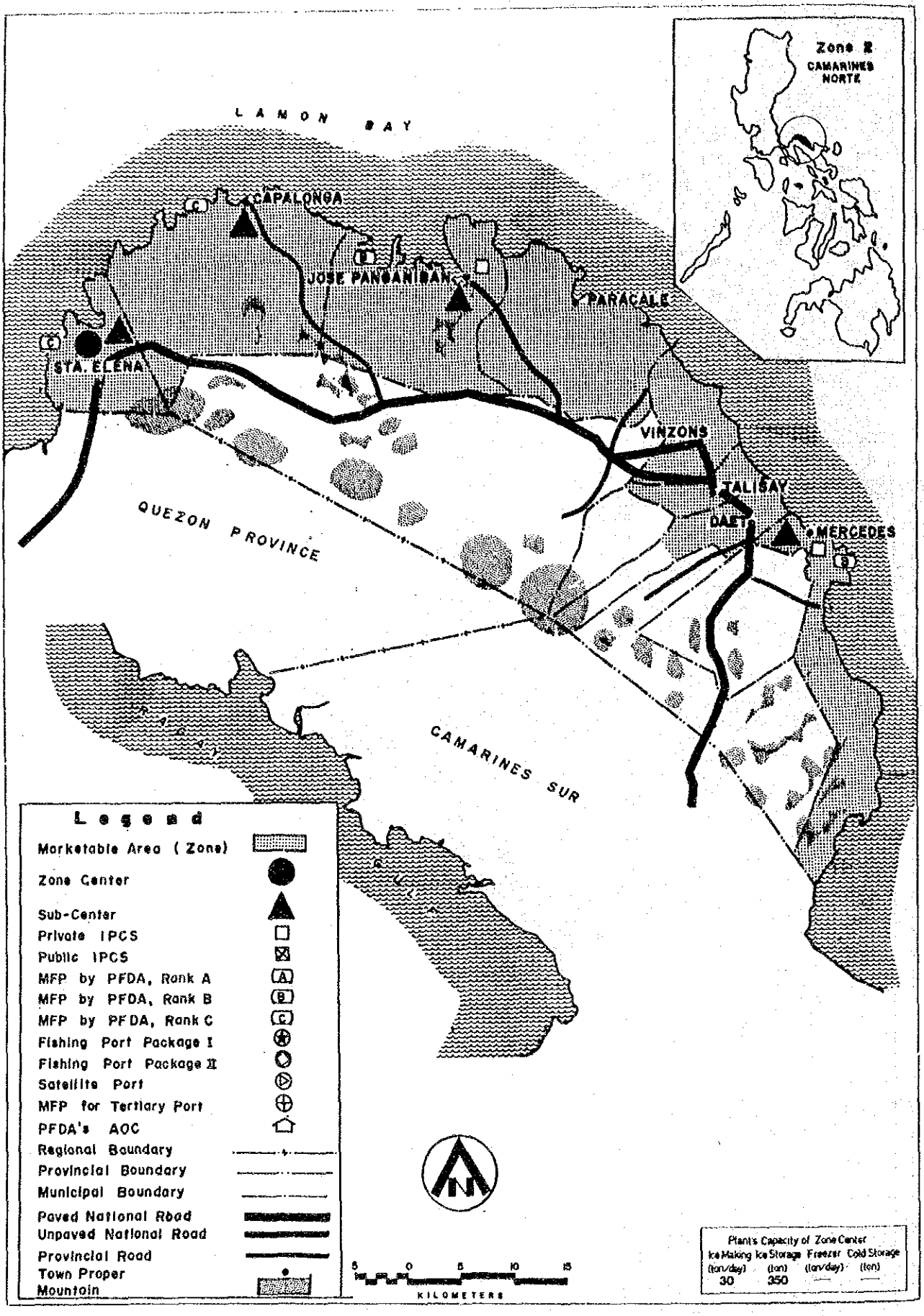

Fig. 7.2 LOCATION OF ZONE CENTER AND SUBCENTERS, ZONE 2

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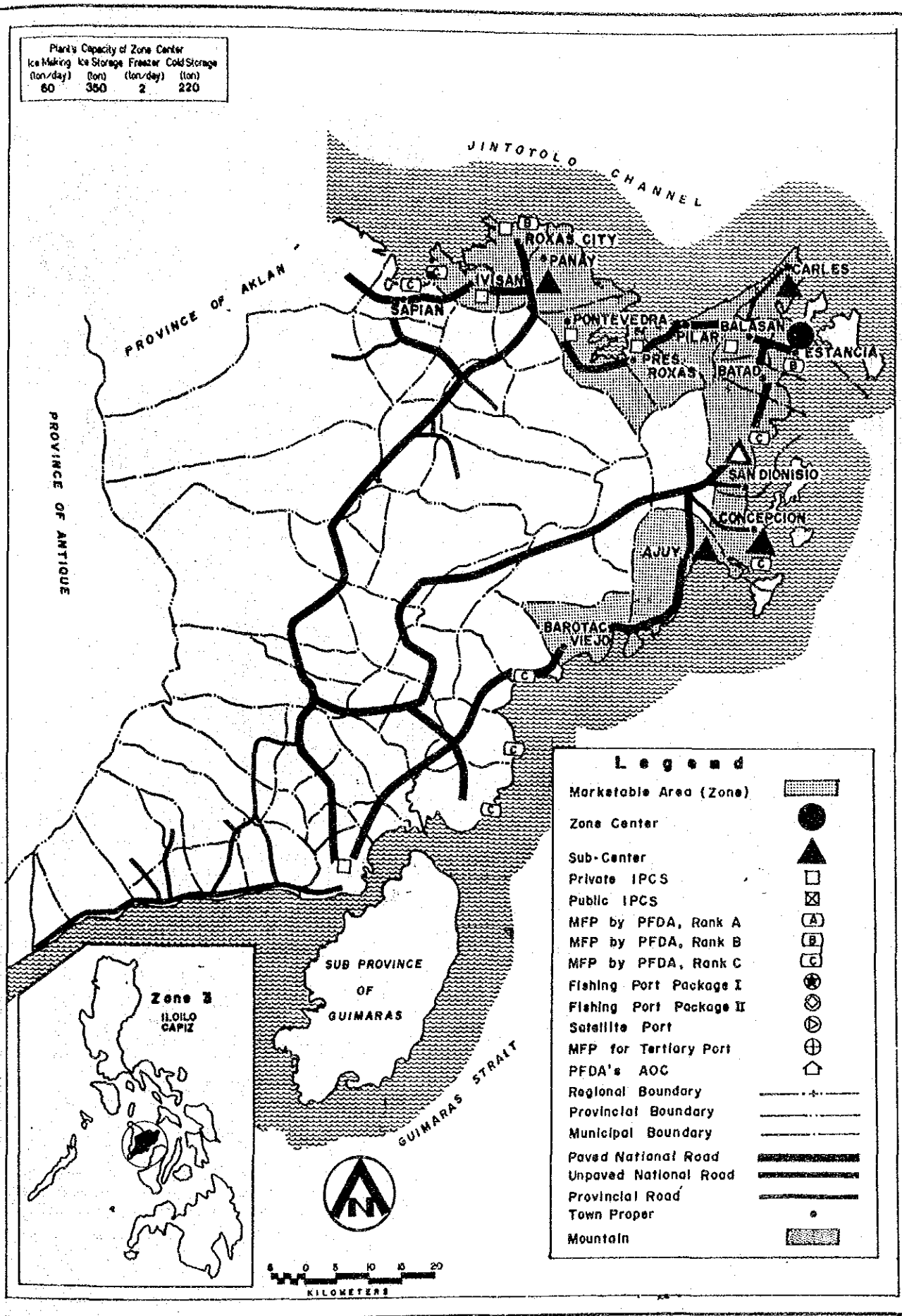

Fig. 7.3 LOCATION OF ZONE CENTER AND SUBCENTERS, ZONE 3

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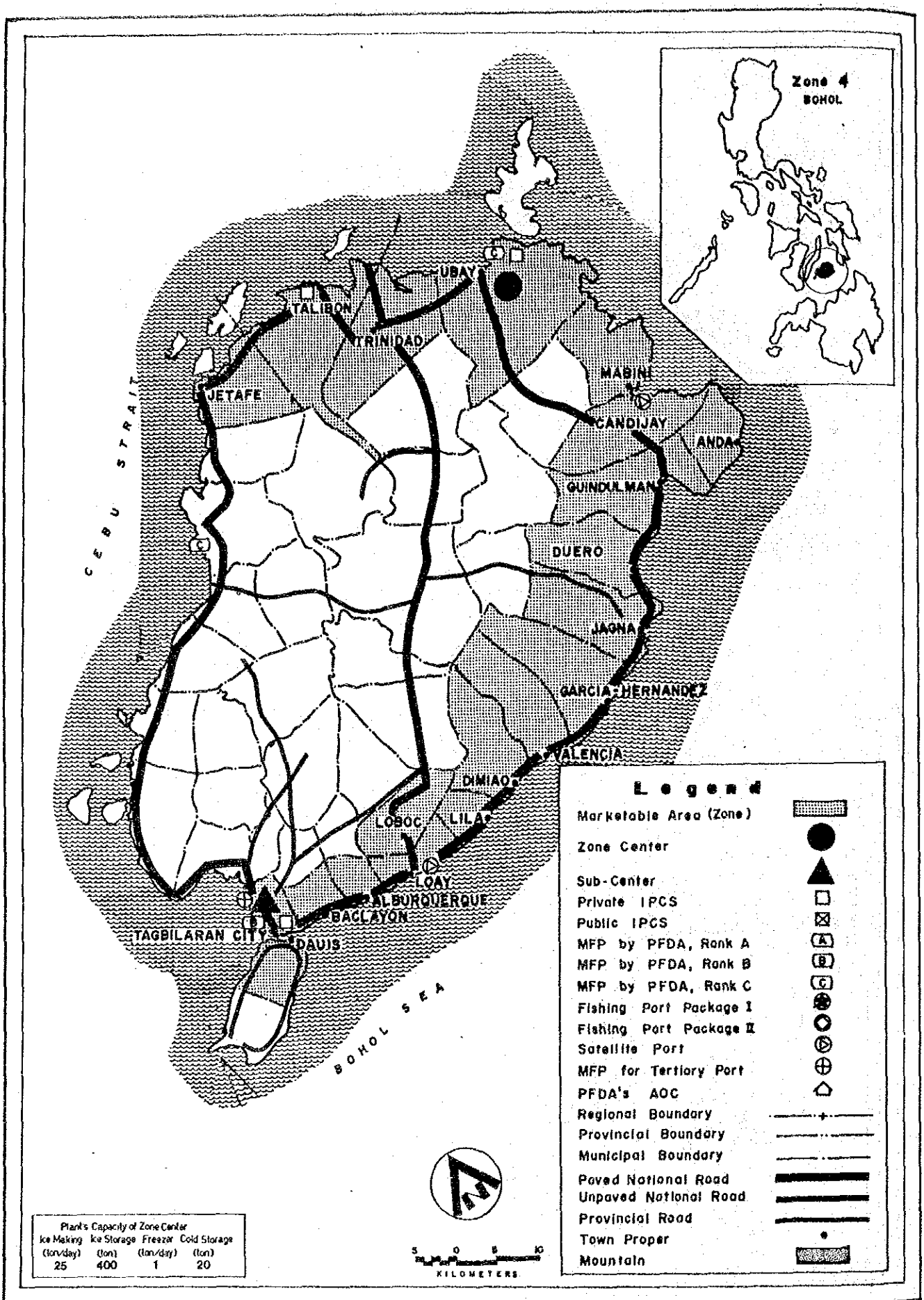

Fig. 7.4 LOCATION OF ZONE CENTER AND SUBCENTER, ZONE 4

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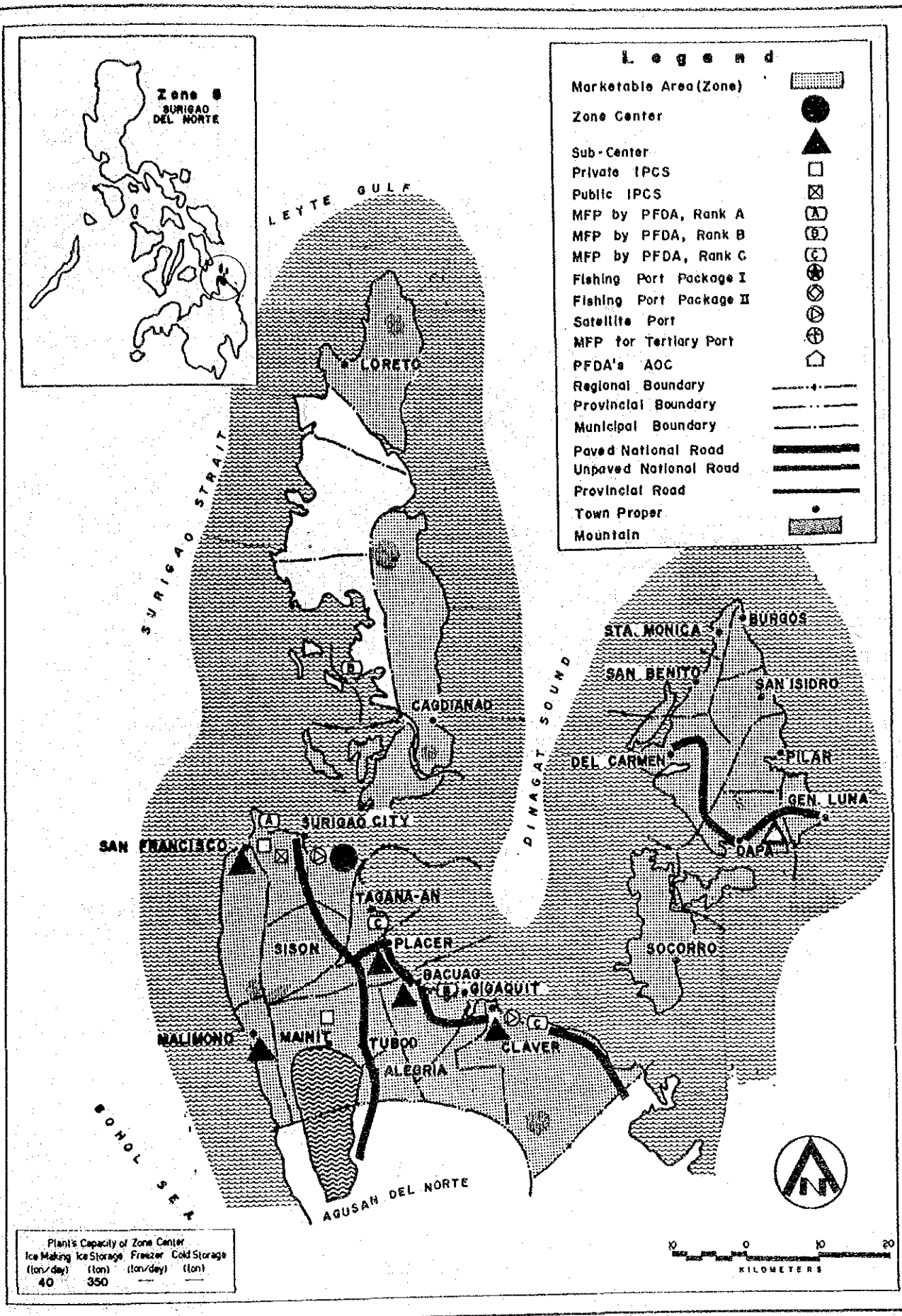

Fig. 7.5 LOCATION OF ZONE CENTER AND SUBCENTERS, ZONE 5

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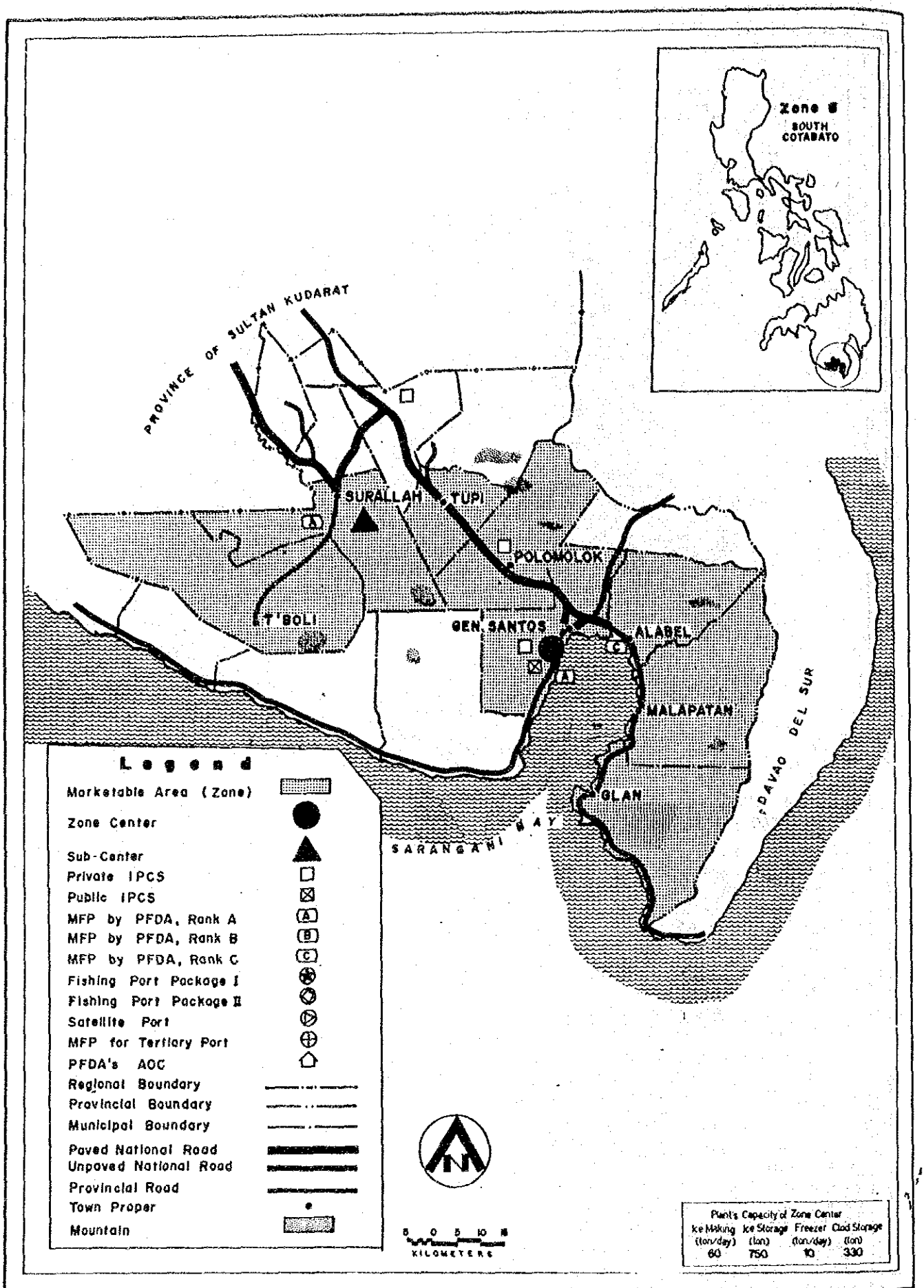

Fig. 7.6 LOCATION OF ZONE CENTER AND SUBCENTER, ZONE 6

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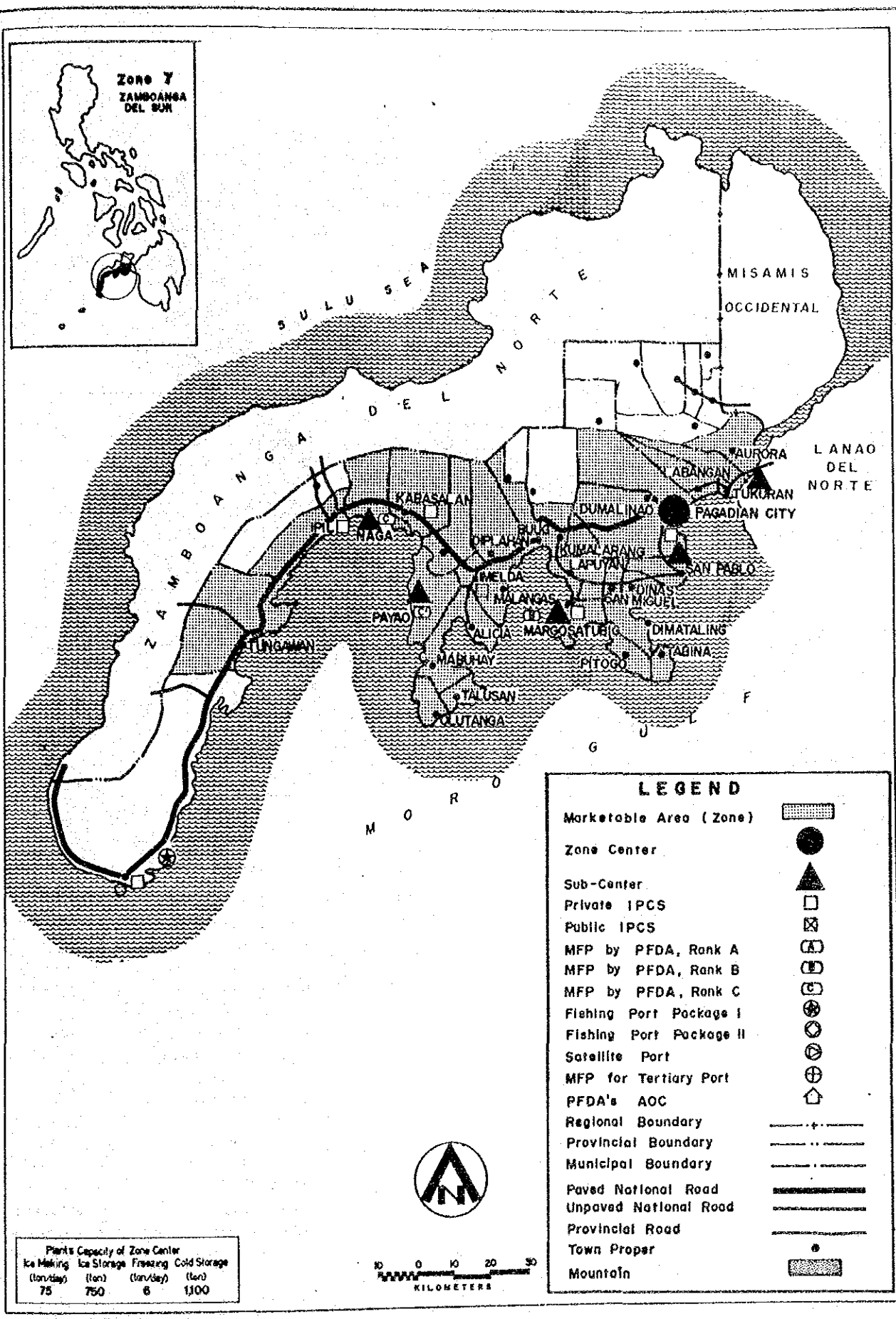

Fig. 7.7 LOCATION OF ZONE CENTER AND SUBCENTERS, ZONE 7

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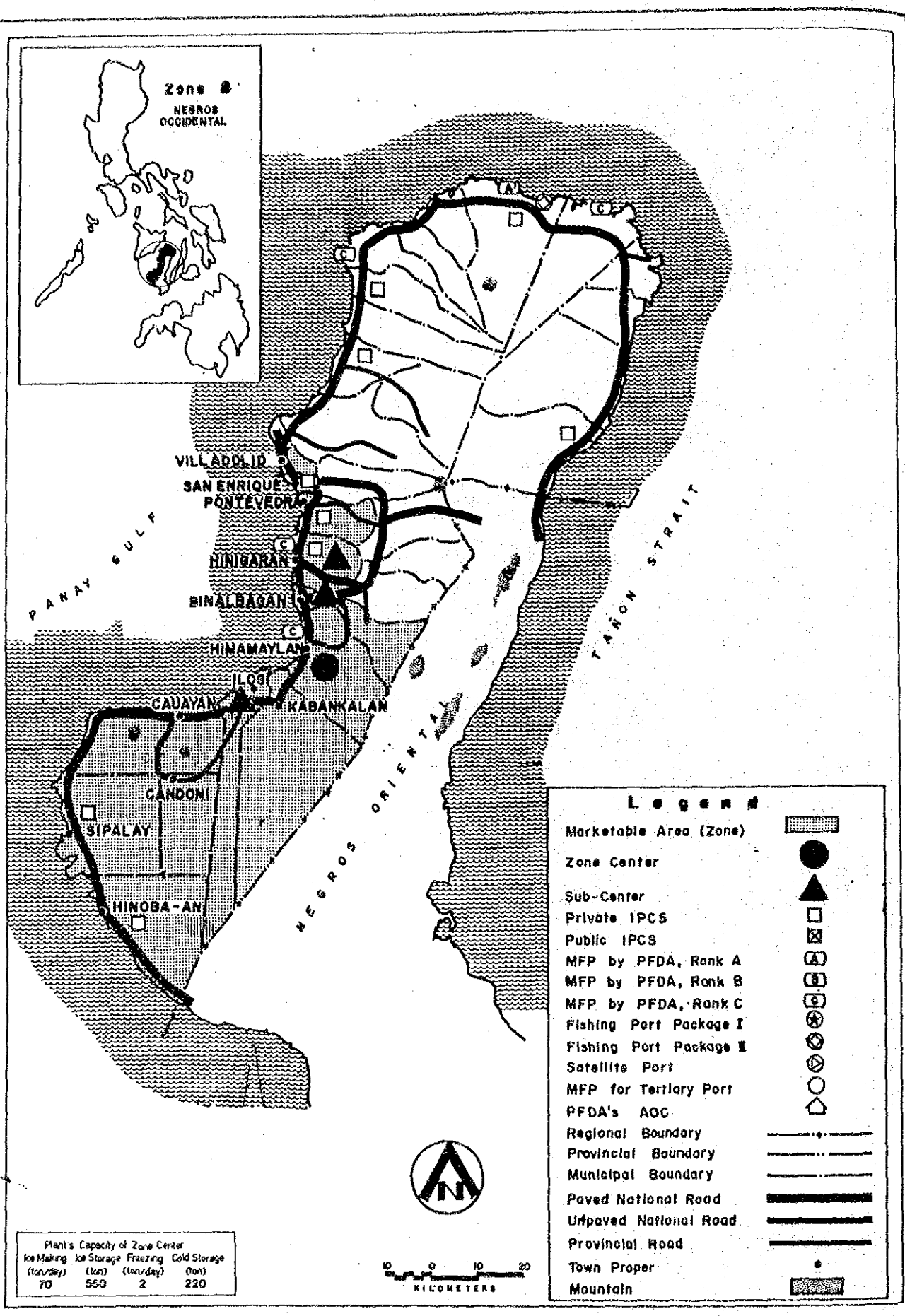

Fig. 7.8 LOCATION OF ZONE CENTER AND SUBCENTERS, ZONE 8

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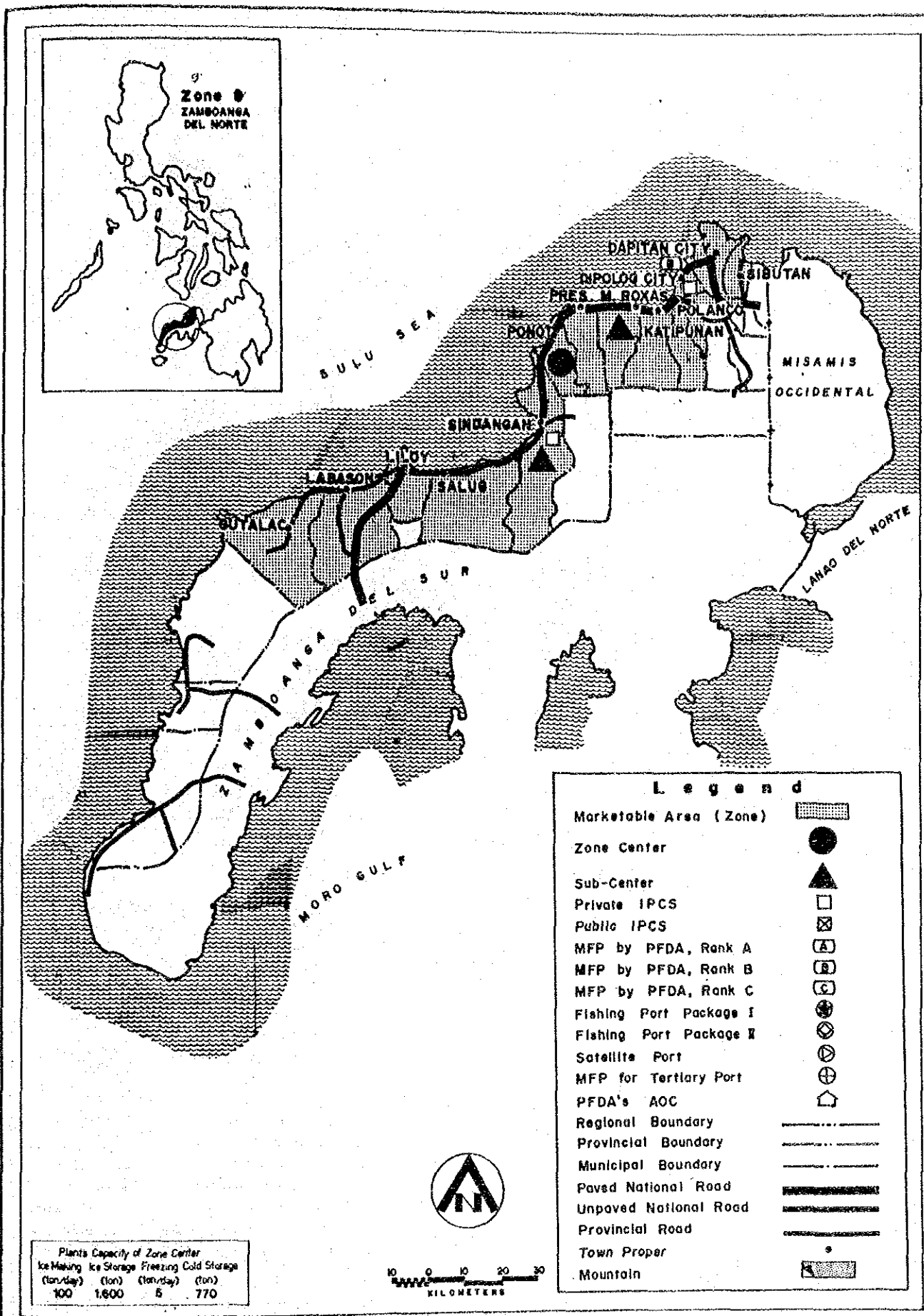

Fig. 7.9 LOCATION OF ZONE CENTER AND SUBCENTERS, ZONE 9

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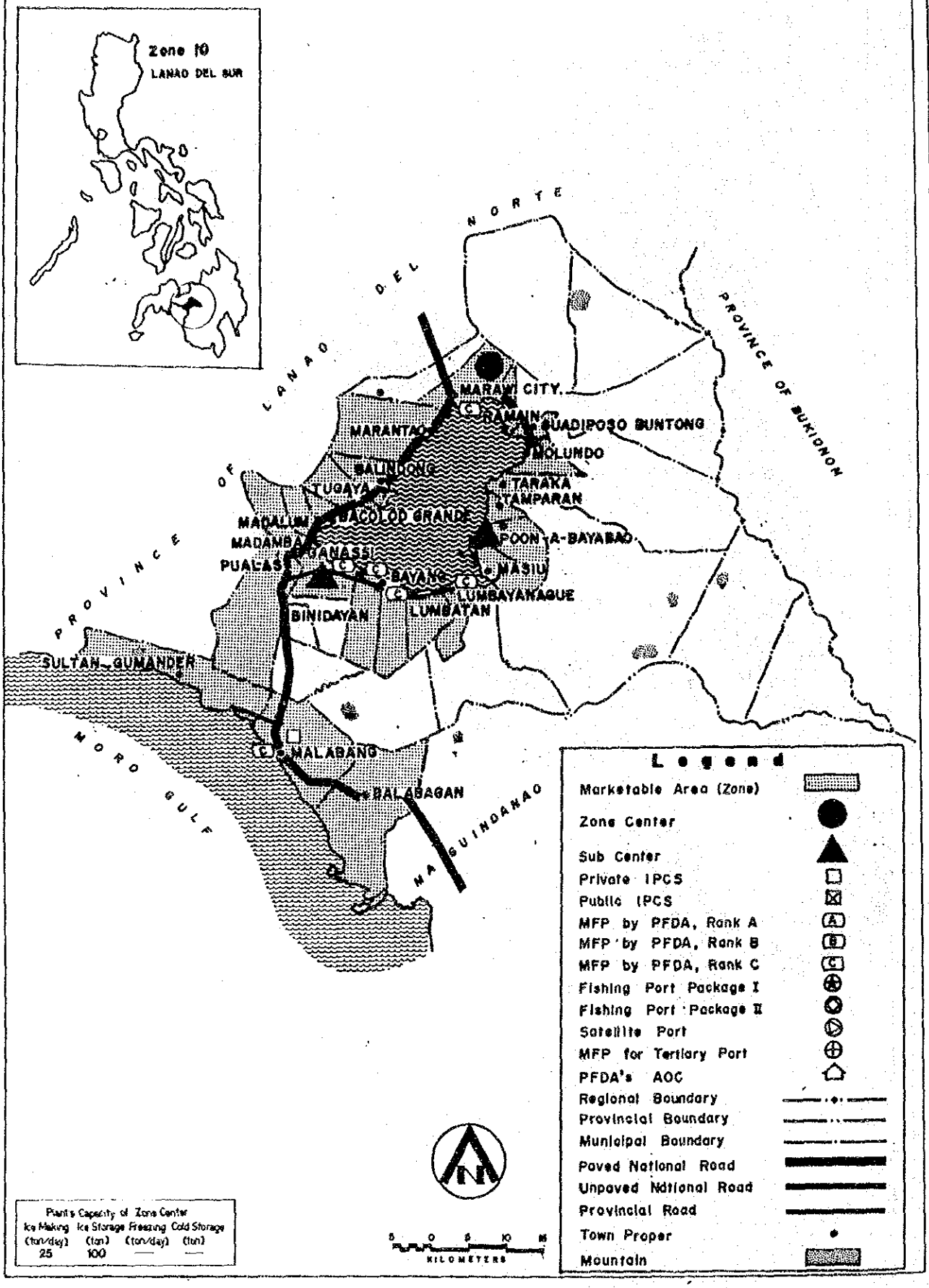

Fig. 7.10 LOCATION OF ZONE CENTER AND SUBCENTERS, ZONE 10

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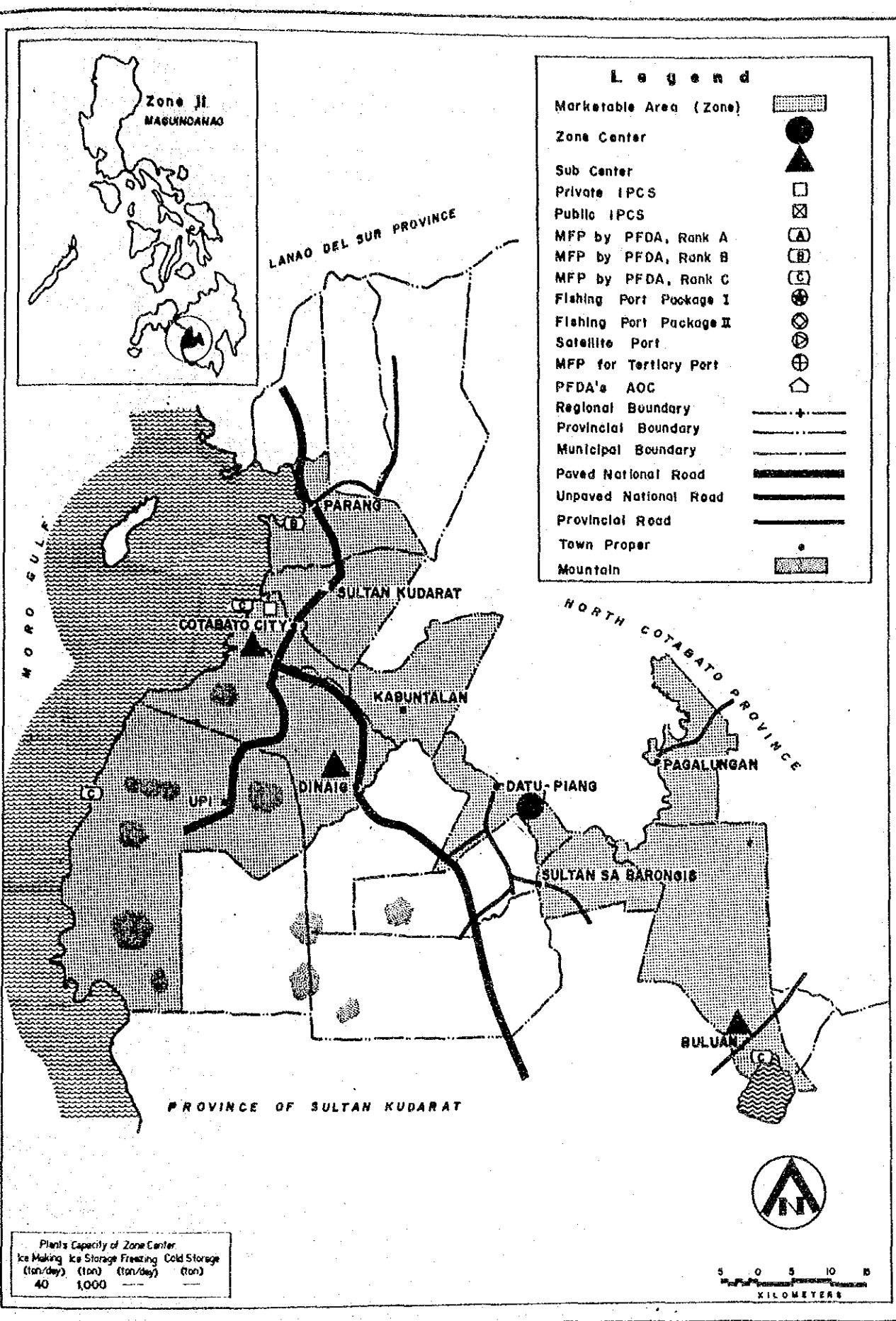

Fig. 7.11 LOCATION OF ZONE CENTER AND SUBCENTERS, ZONE 11

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Table 7.1 ASSESSMENT OF PROVINCES SUITABLE FOR IPCS ZONE SYSTEM

Region		Province	Selection as priority province	Assessment of criteria: Capacity of additional ice plant 2000	No. of IPCS sites proposed by PFDA	Marketable area of ice	Presance of National Project for IPCS	Transportation among the proposed sites
III	1.	Bulacan	O	92 (o)	2 (O)	Wide (O)	- (O)	Good (O)
	2.	Zambales	O	59 (o)	0 (X)	Wide (O)	- (O)	No (X)
IV	3.	Quezon	X	166 (o)	1 (o)	Wide (O)	FPPI (X)	No (X)
	4.	Oriental Mindoro	X	26 (o)	0 (X)	Wide (O)	- (O)	No (X)
	5.	Occidental Mindoro	X	114 (o)	0 (X)	Wide (O)	- (O)	No (X)
	6.	Marinduque	X	28 (o)	1 (o)	Narrow (X)	- (O)	No (X)
	7.	Palawan	X	421 (O)	4 (O)	Wide (O)	ADB (X)	Poor (X)
V	8.	Camarines Norte	O	35 (o)	3 (O)	Wide (O)	- (O)	Good (O)
VI	9.	Iloilo	O	559 (O)	4 (O)	Wide (O)	FPPI (X)	Good (O)
	10.	Capiz	O	92 (o)	0 X	Wide (O)	- (O)	No (X)
	11.	Aklan	X	56 (o)	1 (o)	Narrow (X)	- (O)	No (X)
	12.	Antique	X	64 (o)	0 X	Wide (O)	- (O)	No (X)
	13.	Negros Occidental	O	819 (O)	2 (O)	Wide (O)	FFPII (X) (planned)	Good (O)
VII	14.	Bohol	O	41 (o)	3 (O)	Wide (O)	- (O)	Good (O)
IX	15.	Zamboanga del Norte	O	1,750 (O)	0 X	Wide (O)	- (O)	No (X)
	16.	Zamboanga del Sur	O	675 (O)	4 (O)	Wide (O)	FPPI (X)	Fair (O)
	17.	Basilan	X	292 (O)	1 (o)	Narrow (X)	- (O)	No (X)
	18.	Sulu	X	146 (o)	0 X	Narrow (X)	- (O)	No (X)
X	19.	Surigao del Norte	O	197 (O)	5 (O)	Wide (O)	- (O)	Fair (O)
XI	20.	South Cotabato	O	336 (O)	2 (O)	Wide (O)	- (O)	Fair (O)
XII	21.	Lanao del Sur	O	210 (O)	3 (O)	Wide (O)	- (O)	Fair (O)
	22.	Maguidanao	O	267 (O)	1 (o)	Wide (O)	- (O)	No (X)

Remarks: (1) First selection of Provinces

Out of all provinces, only those which require additional ice plant with the rated capacity of 25 t/day of more were first selected for the choice of provinces suitable for IPCS zone system, as in this way an additional ice plant with 5 t/day or more which is financially viable will still remain for public investment even when a government policy in which the investment for construction sector shall be 20% for public sector and 80% for private sector will be followed.

(2) Final Selection of Pronvices Suitable for IPCS Zone System.

For the final selection of priority provinces (previous suitable for IPCS zone system) five criteria as given in the table above were set up. Then, for each criterion advantage or disadvantage was assessed with the following marks:

O : Highly advantageious

o : Advantageous

X : Disadvantageous

Final selection of priority province was made based on these assessments.

Table 7.2 CLASSIFICATION OF PROTOTYPE SITES AND DETERMINATION OF PLANT CAPACITY

Region		Site	Index A	B	C	D	E	F	G
I.	1.	Pagudpud	71	1	10	−0.2	0	−0.3	
	2.	Pasuquin	79	1	31	−0.2	0	−0.3	Mobile plant
	3.	Magsingal	114	1	2	−0.4	0	−0.5	
	4.	Narvacan	93	1	36	−0.3	0	−0.4	1.0
	5.	Damortis	1,380	1	–	17.3	24.0	21.6	0
	6.	Alaminos	6,384	1	6,154	−27.0	20.0	−33.8	15.0
II.	7.	Ilagan	14	–	10	16.0	16.0	20.0	0
	8.	Bayombong	46	–	46	−0.1	0	−0.1	0
IV.	9.	Balayan	2,107	3	–	−14.5	0	−18.1	15.0
	10.	Buenavista	1,007	3	–	−3.4	0	−4.3	3.0
	11.	Balabac	4,493	3	–	−31.6	0	−39.5	15.0
	12.	El Nido	9,436	1	–	−76.6	0	−95.8	15.0
	13.	Narra	7,045	3	–	−36.5	16.0	−45.6	15.0
	14.	Quezon	2,480	1	–	−9.7	0	−12.1	10.0
	15.	Unisan	3,546	2	2,275	−21.6	0	−27.0	15.0
V.	16.	Balatan	1,589	2	–	0.2	8.0	−0.3	0
	17.	Gabusao	1,679	2	–	−8.1	0	−10.1	10.0
	18.	Calabanga	7,187	2	20	60.8	100.8	76.0	0
	19.	Pasacao	10,625	2	–	−63.8	0	−79.8	15.0
	20.	Gigmoto	308	2	–	−1.1	0	−1.4	1.0
	21.	Virac	862	3	–	3.4	6.4	4.3	0
	22.	Balud	1,272	3	574	−4.8	0	−6.0	5.0
	23.	Pilar	322	2	183	−1.0	0	−1.0	1.0
VI.	24.	New Washington	2,881	3	1,504	−15.5	0	−19.4	15.0
	25.	Tibiao	1,723	1	–	−9.0	0	−11.3	10.0
	26.	Tigbauan	3,297	1	652	−16.7	0	−20.9	15.0
	27.	San Carlos City	1,842	2	1,307	4.0	9.6	5.0	0
VII.	28.	Toledo City	781	2	204	−2.6	0	−3.3	3.0
	29.	Bogo	2,453	3	63	−8.0	4.8	−10.0	10.0
	30.	Dumaguete City	214	2	–	7.1	8.0	8.9	0
	31.	Bayawan	451	2	31	1.7	3.2	2.1	0
VIII.	32.	Borongan	236	2	110	−0.7	0	−0.9	0
	33.	Albuera	2,323	3	–	−13.0	0	−16.3	15.0
	34.	Carigara	1,251	2	–	−1.7	4.0	−2.1	1.0
	35.	Dulag	27	2	–	−0.9	0	−1.1	1.0
	36.	Inopacan	864	3	252	−3.6	0	−4.5	3.0
	37.	Isabel	188	3	–	−0.6	0	−1.0	1.0
	38.	San Isidro	457	2	–	−1.4	0	−1.9	1.0
	39.	Tarangan	1,844	2	–	−11.1	0	−13.9	10.0
	40.	Villareal	290	2	–	−1.0	0	−1.0	1.0
	41.	Wright	532	2	–	−1.8	0	−2.3	1.0
	42.	Liloan	545	2	–	−1.8	0	−2.3	1.0
	43.	Maasin	722	2	84	−0.9	1.6	−1.1	1.0
	44.	Padre Burgos	171	2	31	−0.5	0	−0.6	0
	45.	St. Bernard	234	2	–	−0.8	0	−1.0	1.0
	46.	San Francisco	357	2	–	−1.2	0	−1.5	1.0
	47.	Sogod	266	2	–	−0.1	0.8	−0.1	0
IX.	48.	Tuburan	1	1	–	–	0	–	–
	49.	Sibutu	2,178	1	6	−11.3	0	−14.1	10.0
X.	50.	Buenavista	902	2	837	−2.4	0	−3.0	3.0
	51.	Cabadbaran	439	2	338	6.7	8.0	8.4	0
	52.	Jabonga	294	2	–	−1.0	0	−1.3	1.0
	53.	Malaybalay	34	–	31	−0.1	0	−0.1	0
	54.	Catarman	610	2	–	−2.3	0	−2.9	1.0
	55.	Oroquieta City	4,556	2	102	−13.3	8.0	−16.6	15.0
	56.	Ozamis City	372	2	204	18.3	19.2	22.9	0
	57.	Tangub City	316	2	114	−0.7	0	−0.9	0
	58.	Salay	1,057	2	–	−5.0	0	−6.3	5.0
XI.	59.	Malita	1,051	2	–	−3.5	0	−4.4	3.0
	60.	Caraga	247	2	–	−0.8	0	−1.0	1.0
	61.	Gov. Generoso	825	2	–	13.3	16.0	16.6	0
	62.	Lupon	966	2	–	−3.6	0	−4.5	3.0
	63.	Mati	985	2	–	0.7	4.0	0.9	0
	64.	Barobo	520	2	–	−1.7	0	−2.1	1.0
	65.	Bislig	1,520	2	919	−0.3	4.0	−0.4	0
	66.	Cagwit	407	2	–	−1.3	0	−1.6	1.0
	67.	Cantilan	501	2	165	−0.7	0.8	−0.9	0
	68.	Hinatuan	1,358	2	551	−5.0	0	−6.3	5.0
XII.	69.	Karomatan	3,744	1	385	−21.2	0	−26.5	15.0
	70.	Kolambugan	411	2	24	−1.4	0	−1.8	1.0
	71.	Tubod	283	2	207	−0.8	0	−1.0	1.0
	72.	Midsayap	–	–	–	–	0	–	–
	73.	Lebak	4,294	1	540	−18.0	0	−22.5	15.0
	74.	Lutayan	4,394	–	–	−13.7	0	−17.1	15.0
		TOTAL	128,352		18,002	−352.8	283.2	−449.6	323.0

Remarks: A = Fish production in 2000 (tons/year); B = Major kinds of fish in main fishing ground (1;1st class, 2;2nd class, 3;3rd class); C = Fish pond production in 2000 (tons/day); D = Ice shortage in 2000 at a rated capacity for fishing sector (tons/day); E = Presence of existing ice plants at a rated capacity (tons/day); F = Ice shortage in 2000 at a rated capacity for whole sector (tons/day); G = Proto-type plant capacity (tons/day)

8. FORMULATION OF IPCS SYSTEM

8. FORMULATION OF IPCS SYSTEM

8.1 Shortage of Ice in Zones/Prototype Sites

The shortage of ice for the fisheries sector is shown in Table 8.1 in terms of the rated capacity of the ice plant, assuming 300 operation days per year, 50% opertion ratio and no ice storage.

The total ice shortage in the project area will amount to 3,210 tons/day at the rated capacity in 1990 and 4,340 tons/day in 2000, while for the rest of the country the ice surplus will be 68 tons/day in 1990 and the ice deficit will be 2,782 tons/day in 2000.

The shortage of ice for all zones will be 2,927 tons/day in 1990 and 3,987 tons/day in 2000, which account for 91% and 92% of the total shortage in the project area in 1990 and 2000, respectively.

Regional differences of ice shortage for the fisheries sector in the project area are shown in Table 8.2.

Ice shortage in the project area will be critical in zones of Regions VI and IX in 1990 and 2000. The shortage of ice in 2000 will reach 1,246 tons/day in the project area of Region VI, and 1,249 tons/day in the project area of Region IX. The ice shortage in the zones in these Regions are 1,209 tons/day and 1,238 tons/day, respectively.

Ice shortage by zone and by prototype site are shown in Tables 8.3 and 8.4

8.2 Capacity of IPCS

(1) Ice Plant

a. Zone system

Zone center

The plant capacity was determined, considering ice requirement and the following factors as shown in Table 8.6:

(i) The capacity included in national projects other than this project was deducted from the additional requirement of ice plants in case such

plants are located within the market area of the zone system of IPCS. Those projects are NFPC, FPP I and II, NPFDP and NFDP.

(ii) In Iloilo City, which is a part of the market area of the zone system, ice will be supplied by FPP I and by the existing private plants. Iloilo city was excluded from the market zone of this system as public plants, if newly built, will meet difficulties in competing with the association of ice plant operators in the city, MIIPOA which controls the ice market and price as well as FPP I.

(iii) The capaicty of IPCS was finally determined from the viewpoint of financial viability, considering the seasonal fluctuation of ice demand by the fisheries sector. The optimum capacity was selected among the following:

- Capacity to meet the maximum demand in the peak season
- Capacity to meet the average demand in the peak season
- Capacity to meet the minumum demand in the peak season

According to the financial evaluation, smaller capacity ice plants and larger capacity ice storages are more profitable due to lower operational costs including depreciation cost.

(iv) The plants were planned to be constructed basically by 1990 to meet the requirement in the target year of 2000. The construction of IPCS will be completed by two stages; the initial stage by 1990 and the development stage during the 1990 -2000 period.

(v) 20% allowance of the ice plant capacity was considered to meet ice demand by other sectors including households.

Sub-center

Ice storage of the sub-center will store ice corresponding to 4 days ice demand in the peak season, taking into account the limited space of land in MFP or fish landing sites where the sub-center will be established.

b. Prototype system

The capacity of prototype plants was identified for each site as shown in Table 7.2 according to the following:

(i) The shortage of ice for the fisheries sector is not more than 77 tons/day in a prototype site, assuming 300 operational days per year and an operational ratio of 50%.

It is assumed that the public sector serves only 20% of the total ice requirement considering the contribution of the government sector to the total additional investment for IPCS. Consequently, the maximum capacity of a public plant will be 15 tons/day in any prototype site.

Protoype ice plants were classified into 5 categories, i.e., 1, 3, 5, 10, and 15 tons/day.

(ii) In case that shortage of ice is more than 15 tons/day in a site, the capacity will be 15 tons/day.

(iii) If the shortage is below 15 tons/day in a site, the size of the prototype plant will be selected according to the additional requirement at the site from among the five categories of plant capacity.

(iv) ice storage capacity was designed to satisfy 10 days ice making capacity which is the average volume set in the zone center.

(5) Freezer and cold storage

The optimum capacity of freezers and cold storages was determined as the result of the financial evaluation based upon the projected additional requirement for cold storage considering the seasonal fluctuation of fish catch as shown in Table 8.5.

It was assumed that freezer/cold storages would not be viable financially, if the unit cost, cost of depreciation and energy per kg of ice is higher than the market price per kg of fresh fish. In that case, freezer/cold storages are excluded from the recommended plants. 10% allowance was given to cold storages to serve non-fisheries products. The capacity of freezers and cold storages by zone is shown in Table 8.6.

8.3 Types of Ice

Types of ice have been determined by the following economic, financial and technical criteria:

a. For the long distance transportation of ice, block ice is basically superior to non-block ice such as flake, plate and tube ice.

b. For small-scale ice plants, non-block ice is economically more viable than block ice.

c. For storing large quantity of ice in storage rooms, non-block ice is inferior as it is quite difficult to prevent it from fusion when stored over a long period. It also causes complications in the conveying system when small volume of ice has to be supplied to many small consumers.

d. For storing the same quantity of ice, non-block ice requires more space than block ice. Thus, the construction cost of non-block ice plants will be more expensive than that of block ice plants.

For the above reasons, it is generally recommended that the ice plants in the zones should produce exclusively block ice.

The prototype system is effective at remote areas, in which the zone system is not introduced. In these areas, ice is mainly used for fishing without any significant volume of ice being distributed to the farther areas. Non-block ice will be more viable than block ice in case of the mini-prototype plants of 5 tonners and below, whereas the latter may be financially inferior to the former for the prototype plants of 10 tonners and above.

However, for the final decision of ice type, a further study should be made, taking into account users' preferences and other factors.

8.4 Selection of Zone Centers

11 zone centers were selected according to the following selection criteria:

(i) Fish production in 2000
(ii) Ice shortage in 2000
(iii) Absence of private IPCS in 1983
(iv) Appropriateness of the site as fish/ice distribution center

Zone centers were selected based on the criteria mentioned in Tables 8.7 and 8.8 and additional information obtained through site inspection. The following sites are recommended as zone centers:

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

The centers of zones 8, 9, 10 and 11 are still tentative, because no field survey on infrastructure has yet been made.

8.5 Major Components of the System

(1) Zone System

Major components of the zone system are to be completed by the target year of 2000 as shown in Table 8.9 and Fig. 8.1. Major components are listed as follows:

(i) Basic facilities; ice making plants, ice storage, freezer, freezing room, generator and mobil ice plant.

(ii) Supporting facilities; ice transport vehicle/vessel, spare parts, warehouse for spare parts, workshop/equipment, management office, lodging house and communication equipment.

(iii) Infrastructure; Land reclamation/consolidation, tube-well and other water supply facilities, electric distribution line, parking lot and access road.

a. Basic Facilities

The size of the required ice plant in the zone system is comparatively large, basic facilities being concentrated mainly in the zone center and constructed partly in various sub-centers.

Ice plants and cold storages will be located at the zone center, while only the ice storage will be constructed at sub-centers which are fish landing sites, MFP or the adjacent places. Both ice plants and cold storages are to be built in zones 1, 3, 4, 6, 7, 8 and 9, while only ice plants will be established in Zones 2, 5, 10 and 11.

b. Supporting facilities

(i) Zone center: All of the suppporting facilities will be established in each zone center.

(ii) Sub-center: All sub-centers will be supplied with spare parts, communication equipment and a management office.

c. Infrastructure

(i) Zone center: Land will be consolidated, access road will be built, water and power supply facilities will be installed in the zone centers at Estanica, Pagadian City, Himamaylan, Ponot, Marawi City and Datu Piang.

Land reclamation and consolidation in the Hagonoy fishing port is not included in program for that zone, as it has already been designed by MPWH and is planned to be completed under the Infrastructure Program of MFP.

The zone centers of Sta. Elena and Ubay are located along the national road and therefore there is no need for the construction of an access road.

In Surigao City and General Santos City, the proposed land and the access road have been consolidated for the existing plants which were turned over by BFAR to PFDA. The zone centers of these cities are to be established at the sites of the existing plants.

(ii) Sub-center: A power distribution line will be installed and parking lots will be provided for the ice storage in all the sub-centers, while there will be no need for water supply facilities. The local government will be responsible for reclaiming and consolidating the land and access road in the sub-centers.

(2) Prototype system

The prototype system will be composed of an ice plant, an ice storage, a generator, spare parts and management office as shown in Fig. 8.2.

The infrastructure should be fully developed by the local government and/or relevant agencies.

The prototype ice plant will be constructed after infrastructural facilities have been completed.

The minimum rated capacity of the ice plant is 1 ton/day for each prototype site. However, the following four prototype sites will be grouped to be served by a mobile ice plant of 1 ton/day.

(i) Pagudpud, Ilocos Norte
(ii) Pasuguin, Ilocos Norte
(iii) Magsingal, Ilocos Sur
(iv) Narvacan, Ilocos Sur

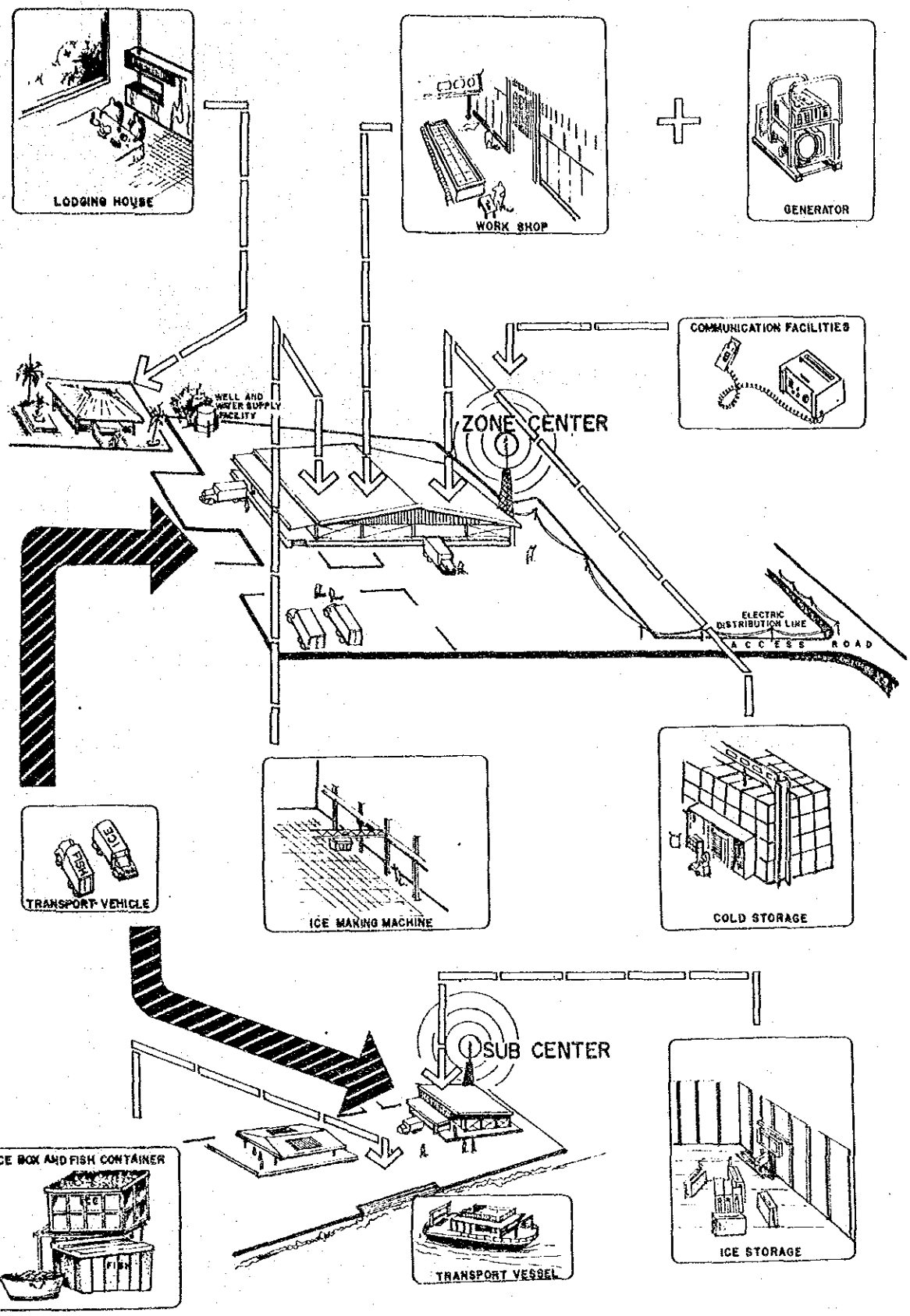

Fig. 8.1 ZONAL IPCS NETWORK SYSTEM

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

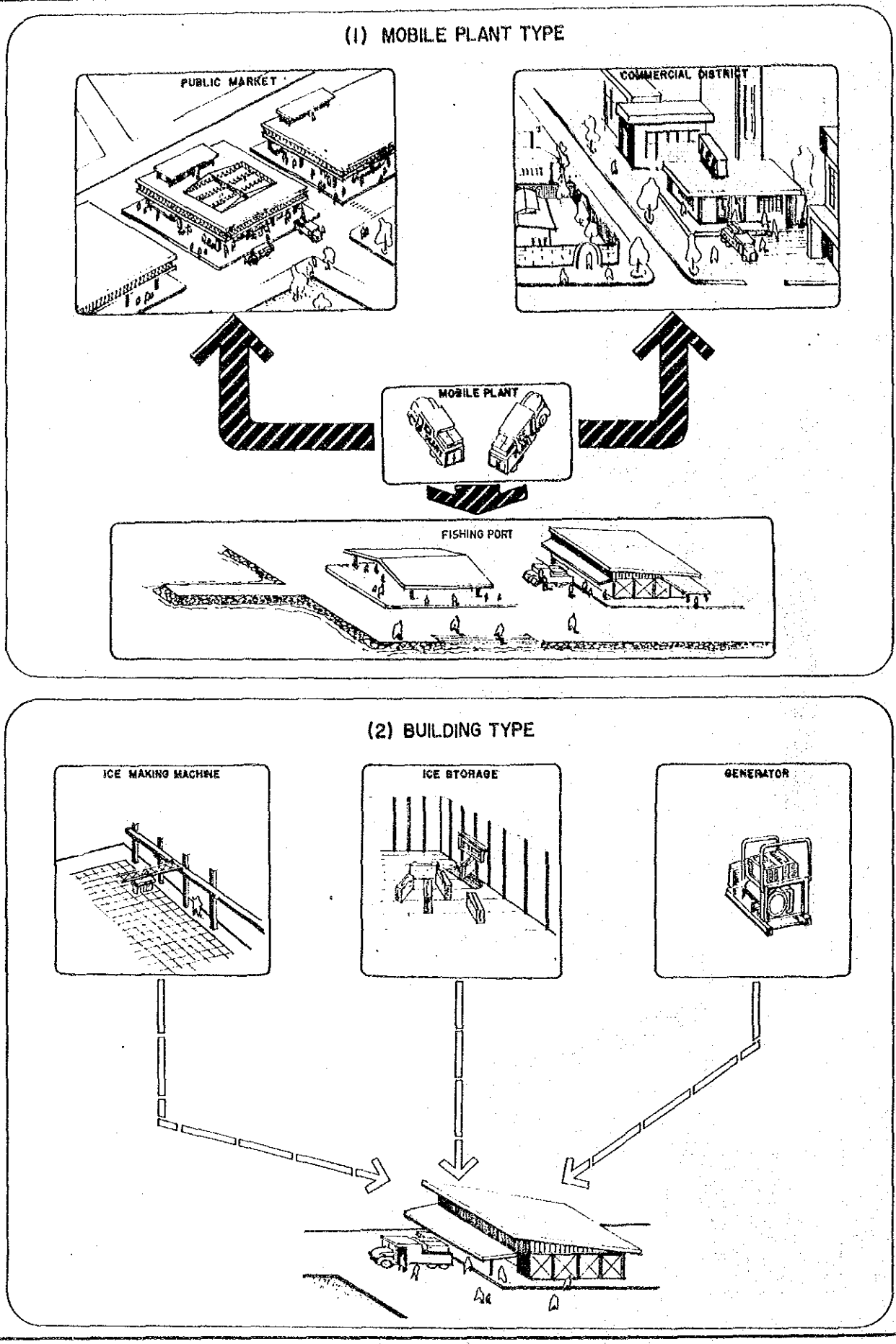

Fig. 8.2 PROTOTYPE IPCS SYSTEM

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

Table 8.1 SHORTAGE OF ICE PLANT FOR FISHERY SECTOR IN THE COUNTRY IN 1990 AND 2000

Unit: tons/Day

Zone	1990 Rated capacity of existing ice plants, 1983 (S)	1990 Daily demand for ice for fishery sector (D)	1990 Shortage of ice plants (S)-(D)	2000 Rated capacity of existing ice plants (S)	2000 Daily demand for ice for fishery sector (D)	2000 Shortage of ice plants (S)-(D)
1. Project Area						
1) Zone	1,972	4,899	-2,927	1,972	5,959	-3,987
2) Proto-type	283	566	-283	283	636	-353
Sub-total	2,225	5,465	-3,210	2,255	6,595	-4,340
2. Rest of Area	7,403	7,335	+68	7,403	10,185	-2,782
TOTAL	9,658	12,800	-3,142	9,658	16,780	-7,122

Remarks: (1) In NCR, 42% of the total ice produced is sold to the fishery sector, whereas 80% in other areas.

(2) Total figures are quoted from Table 6.7.

(3) Negative figure of (S) - (D) above means the shortage of ice plant in terms of rated capacity.

(4) Shortage of ice plants is shown by the rated capacity.

Table 8.2 SHORTAGE OF ICE PLANT FOR FISHERY SECTOR IN THE PROJECT AREA BY REGION IN 1990 AND 2000

Unit: tons/day

Region	1990			2000		
	Zone System	Proto-type	Total	Zone System	Proto-type	Total
NCR	-	-	-	-	-	-
I	-	0.0	0.0	-	-11	-11
II	-	+16	+16	-	+16	+16
III	-76	-	-76	-225	-	-225
IV	-	-153	-153	-	-194	-194
V	-41	-27	-68	-42	-15	-57
VI	-1,033	-30	-1,063	-1,209	-37	-1,246
VII	-21	-3	-24	-39	-2	-41
VIII	-	-40	-40	-	-41	-41
IX	-921	-10	-931	-1,238	-11	-1,249
X	-300	+7	-293	-289	+0	-289
XI	-174	-1	-175	-468	-3	-471
XII	-361	-42	-403	-477	-55	-532
TOTAL	-2,927	-283	-3,210	3,987	-353	-4,340

Remarks: (1) Negative figures indicate the shortage of ice plants in terms of the rated capacity by Regions assuming that there will be no increase of ice plant after 1983.

(2) Rated capacity was calculated assuming 300 day operation per year and 50% operational ratio.

Table 8.3 SHORTAGE OF ICE PLANT BY ZONE IN 1990 AND 2000

Unit: tons/day

Zone No.	Provinces covered	1990 Rated capacity of existing ice plants 1983 (S)	1990 Daily demand of ice for fishery sector (D)	1990 Shortage of ice plant for fishery sector (A)=(S)-(D)	1990 Shortage of ice plant for whole sector (A)/0.8	2000 Rated capacity of existing ice plants 1983 (S)	2000 Daily demand of ice for fishery sector (D)	2000 Shortage of ice plant for fishery sector (C)=(S)-(D)	2000 Shortage of ice plant for whole sector (A)/0.8
1.	Bataan, Bulacan, Zambales, Pampenga	940	1,016	-76	-95	940	1,165	-225	-281
2.	Camarines Norte	68	109	-41	-51	68	109	-41	-52
3.	Iloilo, Capiz	465	1,178	-713	-892	465	1,243	-778	-971
4.	Bohol	18	40	-22	-27	18	57	-39	-49
5.	Surigao del Norte	9	309	-300	-375	9	297	-288	-361
6.	South Cotabato	258	432	-174	-218	258	726	-468	-586
7.	Zamboanga del Sur	120	528	-408	-510	120	741	-621	-776
8.	Negros Occidental	53	371	-318	-398	53	483	-430	-538
9.	Zamboanga del Norte	18	531	-513	-641	18	637	-619	-773
10.	Lanao del Sur	7	167	-160	-199	7	210	-203	-253
11.	Maguindanao	16	218	-202	-253	16	291	-275	-344
	Zone Total	1,972	4,899	-2,927	-3,659	1,972	5,959	-3,987	-4,984

Remarks: Shortage of the plant for the whole sector was obtained by dividing (A) by 0.8 as 20% of ice produced are generally sold for non-fishing purposes.

Table 8.4 SHORTAGE OF ICE PLANT FOR FISHERY SECTOR BY PROTOTYPE SITE

Unit: ton/day

Region		Site	1983 S	1983 D	1983 S-D	1990 S	1990 D	1990 S-D	2000 S	2000 D	2000 S-D
I.	1.	Pagudpud	0	0.2	-0.2	0	0.2	-0.2	0	0.2	-0.2
	2.	Pasuquin	0	0.2	-0.2	0	0.2	-0.2	0	0.2	-0.2
	3.	Magsingal	0	0.4	-0.4	0	0.4	-0.4	0	0.4	-0.4
	4.	Narvacan	0	0.2	-0.2	0	0.2	-0.2	0	0.3	-0.3
	5.	Damortis	24.0	6.9	17.1	24.0	6.9	17.1	24.0	6.7	17.3
	6.	Alaminos	20.0	16.5	3.5	20.0	35.9	-15.9	20.0	47.0	-27.0
II.	7.	Ilagan	16.0	0	16.0	16.0	0	16.0	16.0	0	16.0
	8.	Bayombong	0	0	0	0	0	0	0	0.1	-0.1
IV.	9.	Balayan	0	11.7	-11.7	0	12.8	-12.8	0	14.5	-14.5
	10.	Buenavista	0	2.2	-2.2	0	3.0	-3.0	0	3.4	-3.4
	11.	Balabac	0	15.0	-15.0	0	22.1	-22.1	0	31.6	-31.6
	12.	El Nido	0	43.4	-43.4	0	65.5	-65.5	0	76.6	-76.6
	13.	Narra	16.0	33.3	-17.3	16.0	46.7	-30.7	16.0	52.5	-36.5
	14.	Quezon	0	7.7	-7.7	0	9.8	-9.8	0	9.7	-9.7
	15.	Unisan	0	10.0	-10.0	0	11.9	-11.9	0	21.6	-21.6
V.	16.	Balatan	8.0	8.6	-0.6	8.0	9.2	-1.2	8.0	8.2	-0.2
	17.	Cabusao	0	8.4	-8.4	0	9.2	-9.2	0	8.1	-8.1
	18.	Calabanga	100.8	40.7	60.1	100.8	44.5	56.3	100.8	40.0	60.8
	19.	Pasacao	0	65.0	-65.0	0	71.4	-71.4	0	63.8	-63.8
	20.	Gigmoto	0	1.6	-1.6	0	1.3	-1.3	0	1.1	-1.1
	21.	Virac	6.4	2.8	3.6	6.4	2.9	3.5	6.4	3.0	3.4
	22.	Balud	0	3.1	-3.1	0	2.9	-2.9	0	4.8	-4.8
	23.	Pilar	0	0.6	-0.6	0	0.8	-0.8	0	1.0	-1.0
VI.	24.	New Washington	0	10.8	-10.8	0	13.4	-13.4	0	15.5	-15.5
	25.	Tibiao	0	9.5	-9.5	0	9.5	-9.5	0	9.0	-9.0
	26.	Tigbauan	0	9.5	-9.5	0	13.4	-13.4	0	16.7	-16.7
	27.	San Carlos City	9.6	2.8	6.8	9.6	3.0	6.6	9.6	5.6	4.0
VII.	28.	Toledo City	0	2.1	-2.1	0	2.2	-2.2	0	2.6	-2.6
	29.	Bogo	4.8	11.9	-7.1	4.8	12.1	-7.3	4.8	12.8	-8.0
	30.	Dumaguete City	8.0	0.5	7.5	8.0	0.6	7.4	8.0	0.9	7.1
	31.	Bayawan	3.2	1.3	1.9	3.2	1.4	1.8	3.2	1.5	1.7
VIII.	32.	Borongan	0	0.5	-0.5	0	0.5	-0.5	0	0.7	-0.7
	33.	Albuera	0	13.2	-13.2	0	13.6	-13.6	0	13.0	-13.0
	34.	Carigara	4.0	5.0	-1.0	4.0	4.8	-0.8	4.0	5.7	-1.7
	35.	Dulag	0	0.9	-0.9	0	0.9	-0.9	0	0.9	-0.9
	36.	Inopacan	0	3.0	-3.0	0	2.9	-2.9	0	3.6	-3.6
	37.	Isabel	0	0.6	-0.6	0	0.6	-0.6	0	0.6	-0.6
	38.	San Isidro	0	1.4	-1.4	0	1.4	-1.4	0	1.4	-1.4
	39.	Tarangan	0	11.0	-11.0	0	11.5	-11.5	0	11.1	-11.1
	40.	Villareal	0	1.0	-1.0	0	1.0	-1.0	0	1.0	-1.0
	41.	Wright	0	2.3	-2.3	0	2.0	-2.0	0	1.8	-1.8
	42.	Liloan	0	2.3	-2.3	0	1.8	-1.8	0	1.8	-1.8
	43.	Maasin	1.6	3.0	-1.4	1.6	2.3	-0.7	1.6	2.5	-0.9
	44.	Padre Burgos	0	0.6	-0.6	0	0.5	-0.5	0	0.5	-0.5
	45.	St. Bernard	0	1.0	-1.0	0	0.8	-0.8	0	0.8	-0.8
	46.	San Francisco	0	1.1	-1.1	0	1.2	-1.2	0	1.2	-1.2
	47.	Sogod	0.8	1.1	-0.3	0.8	0.9	-0.1	0.8	0.9	-0.1
IX.	48.	Tuburan	0	0	0	0	–	–	0	–	–
	49.	Sibutu	0	10.9	-10.9	0	9.6	-9.6	0	11.3	-11.3
X.	50.	Buenavista	0	0.7	-0.7	0	0.8	-0.8	0	2.4	-2.4
	51.	Cabadbaran	8.0	0.4	7.6	8.0	0.6	7.4	8.0	1.3	6.7
	52.	Jabonga	0	0.5	-0.5	0	0.8	-0.8	0	1.0	-1.0
	53.	Malaybalay	0	0	0	0	0	0	0	0.1	-0.1
	54.	Catarman	0	2.8	-2.8	0	2.8	-2.8	0	2.3	-2.3
	55.	Oroquieta City	8.0	14.1	-6.1	8.0	17.3	-9.3	8.0	21.3	-13.3
	56.	Ozamis City	19.2	0.6	18.6	19.2	0.5	18.7	19.2	0.9	18.3
	57.	Tangub City	0	0.7	-0.7	0	0.6	-0.6	0	0.7	-0.7
	58.	Salay	0	4.0	-4.0	0	4.4	-4.4	0	5.0	-5.0
XI.	59.	Malita	0	4.1	-4.1	0	4.1	-4.1	0	3.5	-3.5
	60.	Caraga	0	0.8	-0.8	0	0.8	-0.8	0	0.8	-0.8
	61.	Gov. Generoso	16.0	2.8	13.2	16.0	2.8	13.2	16.0	2.7	13.3
	62.	Lupon	0	4.0	-4.0	0	4.4	-4.4	0	3.6	-3.6
	63.	Mati	4.0	3.4	0.6	4.0	3.6	0.4	4.0	3.3	0.7
	64.	Barobo	0	1.7	-1.7	0	1.7	-1.7	0	1.7	-1.7
	65.	Bislig	4.0	2.6	1.4	4.0	2.7	1.3	4.0	4.3	-0.3
	66.	Cagwit	0	1.4	-1.4	0	1.3	-1.3	0	1.3	-1.3
	67.	Cantilan	0.8	1.2	-0.4	0.8	1.2	-0.4	0.8	1.5	-0.7
	68.	Hinatuan	0	3.3	-3.3	0	3.1	-3.1	0	5.0	-5.0
XII.	69.	Koromatan	0	11.9	-11.9	0	15.9	-15.9	0	21.2	-21.2
	70.	Kolambugan	0	1.4	-1.4	0	1.3	-1.3	0	1.4	-1.4
	71.	Tubod	0	0.4	-0.4	0	0.4	-0.4	0	0.8	-0.8
	72.	Midsayap	0	0	0	0	0	0	0	–	–
	73.	Lebak	0	12.0	-12.0	0	12.3	-12.3	0	18.0	-18.0
	74.	Lutayan	0	11.4	-11.4	0	12.7	-12.7	0	13.7	-13.7
		Total	283.2	472	-188.8	283.2	565.8	-282.6	283.2	636.0	-352.8

Remarks : (1) S: Rated capacity of existing ice plants to supply ice to fishery sector
(2) D: Demand for rated capacity of ice plants in fishery sector
(3) S-D: This figure will indicate the requirement of additional ice plants for fishery sector in terms of the rated capacity

Table 8.5 REQUIREMENT AND PLANT CAPACITY OF COLD STORAGE FOR FISHERY SECTOR BY ZONE IN 2000

Zone	Requirement						Planned capacity	
	For export		For domestic Consumption		For public sector			
	Freezer	Cold Storage	Feezer	Cold Storage	Freezer	Cold Storage	Freezer	Cold Storage
1	30	650	0	0	6	130	3	90
2	0	0	23	1,016	5	200	0	0
3	2	28	96	8,541	20	1,800	2	200
4	5	77	0	0	1	15	1	15
5	0	0	0	0	0	0	0	0
6	78	1,870	0	0	16	400	10	300
7	8	149	178	18,555	38	4,000	6	1,000
8	0	2	71	6,296	15	1,300	2	200
9	2	33	149	15,510	30	3,000	5	700
10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
Total	125	2,809	517	49,918	125	14,670	29	2,505

Remarks: (1) Unit: Reezer = ton/day Cold storage = ton

(2) Contribution of public sector was set at 20% of total cold storage, in view of the government promotion policy for the private sector.

(3) The planned capacity is considered most viable capacity based upon seasonal fluctuation of requirement of frozen fish and financial viabllity.

Table 8.6 PLANT CAPACITY BY ZONE TO BE COMPLETED BY TARGET YEARS, 1990 AND 2000

		Ice making (t/d)			Ice storage (t)			Freezer (t/d)	Cold storage (t)
		1990	2000	Total	1990	2000	Total	2000	2000
Zone 1									
Center	Hagonoy	10.0	10.0	20.0	40.0	60.0	100.0	3.0	100.0
Sub-center	Abucay	0	0	0	5.0	0	5.0	0	0
	Samal	0	0	0	5.0	0	5.0	0	0
	Obando	0	0	0	10.0	0	10.0	0	0
	Masinloc	0	0	0	30.0	0	30.0	0	0
Zone 2									
Center	Sta. Elena.	30.0	0	30.0	350.0	0	350.0	0	0
Sub-center	Sta. Elena (F.P.)	0	0	0	40.0	0	40.0	0	0
	J. Panganiban	0	0	0	5.0	0	5.0	0	0
	Capalonga	0	0	0	6.0	0	6.0	0	0
	Mercedes	0	0	0	70.0	0	70.0	0	0
Zone 3									
Center	Estancia	60.0	0	60.0	350.0	0	350.0	2.0	220.0
Sub-center	Conception	0	0	0	25.0	0	25.0	0	0
	Sandionicio	0	0	0	25.0	0	25.0	0	0
	Ajui	0	0	0	45.0	0	45.0	0	0
	Carles	0	0	0	30.0	0	30.0	0	0
	Panay	0	0	0	45.0	0	45.0	0	0
Zone 4									
Center	Ubay	12.5	12.5	25.0	200.0	200.0	400.0	1	20.0
Sub-center	Tagbilaran City	0	0	0	10.0	0	10.0	0	0
Zone 5									
Center	Surigao City	40.0	0	40.0	350.0	0	350.0	0	0
Sub-center	Bacuog	0	0	0	7.0	0	7.0	0	0
	Cleaver	0	0	0	15.0	0	15.0	0	0
	Dapa	0	0	0	85.0	0	85.0	0	0
	Placer	0	0	0	20.0	0	20.0	0	0
	Malimono	0	0	0	20.0	0	20.0	0	0
	San Francisco	0	0	0	20.0	0	20.0	0	0
Zone 6									
Center	Gen. Santos City	30.0	30.0	60.0	375.0	375.0	750.0	10.0	330.0
Sub-center	Suralah	0	0	0	15.0	0	15.0	0	0
Zone 7									
Center	Pagadian City	75.0	0	75.0	75.0	0	750.0	6.0	1,100.0
Sub-center	Margosa Tubic	0	0	0	70.0	0	70.0	0	0
	Naga	0	0	0	40.0	0	40.0	0	0
	Payao	0	0	0	50.0	0	50.0	0	0
	Sanpablo	0	0	0	40.0	0	40.0	0	0
	Tukuran	0	0	0	30.0	0	30.0	0	0
Zone 8									
Center	Himamaylan	70.0	0	70.0	550.0	0	550.0	2.0	220.0
Sub-center	Binalbagan	0	0	0	80.0	0	80.0	0	0
	Hinigavan	0	0	0	55.0	0	55.0	0	0
	Ilog	0	0	0	40.0	0	40.0	0	0
Zone 9									
Center	Ponot	100.0	0	100.0	1,600.0	0	1,600.0	5.0	770.0
Sub-center	Sindangan	0	0	0	140.0	0	140.0	0	0
	P.M. Roxas	0	0	0	120.0	0	120.0	0	0
Zone 10									
Center	Marawi City	25.0	0	25.0	100.0	0	100.0	0	0
	Poon-A-Baya-Bao	0	0	0	40.0	0	40.0	0	0
	Ganassi	0	0	0	30.0	0	30.0	0	0
Zone 11									
Center	Datu Piang	40.0	0	40.0	1,000.0	0	1,000.0	0	0
Sub-center	Buluan	0	0	0	25.0		25.0	0	0
	Cotabato City	0	0	0	80.0		80.0	0	0
	Dinaig	0	0	0	50.0		50.0	0	0

Table 8.7 RANKING OF SITES AS ZONE CENTERS FROM MARKETING ASPECT ON IPCS

Zone	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) Ajui*	14,076	92.6	0	–	6	6	6	–	6.0	X
(5) Caries*	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
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	–	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) Margosa Tubig	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	-52.6	0	–	1	1	4	–	2.0	X
9. Zone 9										
(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) Poon A 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) Dinaig*	4,842	-30.1	0	–	2	2	4	–	2.7	X

Remarks: (1) *: Indicates the sites additional to these proposed sites by PFDA during the Study period.
(2) Ranking as zone centers was tantatively determined by site index.
(3) Same comparative weight by index was assumed to be the same among all index.
(4) Index: 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)
(5) Ranking: AP; Average Points, SZ; Selection of Zone Center (0, Zone Center).

Table 8.8 ASSESSMENT OF INFRASTRUCTURAL CONDITIONS OF THE PROPOSED SITES IN EACH ZONE

Criteria	Zone I				Zone II				Zone III			Zone IV	
						MFP							
	A	S	H	O	SE	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

Remarks: (1) Ranking

Rank A; Advantageous
Rank B; Medium
Rank C; Disadvantageous
-; 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.

(3) Field survey on infrastructural conditions of the proposed sites by PFDA was conducted only for the selected four zones to collect supplementary information for site selection for a zone center.

Table 6.9 MAJOR COMPONENTS OF FACILITIES AND EQUIPMENT BY ZONE SYSTEM (Continued)

Zone	(A) Basic Facilities					
	Ice Plant	Cold Storage		Ice Storage	Generator	Mobile Ice Plant
		Freezer	Freezing Room			
1. Zone 1						
(1) Abucay	X	X	X	O	X	X
(2) Samal	X	X	X	O	X	X
*(3) Hagonoy	O	O	O	O	O	X
(4) Obando	X	X	X	O	X	X
(5) Masinloc	X	X	X	O	X	X
2. Zone 2						
*(1) Sta. Elena	O	X	X	O	O	X
(2) MFP in Sta. Elena	X	X	X	O	X	X
(3) J. Panganiban	X	X	X	O	X	X
(4) Capalonga	X	X	X	O	X	X
(5) Mercedes	X	X	X	O	X	X
3. Zone 3						
(1) Concepcion	X	X	X	O	X	X
(2) San Dionisio	X	X	X	O	X	X
*(3) Estancia	O	O	O	O	O	X
(4) Ajui	X	X	X	O	X	X
(5) Carles	X	X	X	O	X	X
(6) Panay	X	X	X	O	X	X
4. Zone 4						
(1) Tagbilaran	X	X	X	O	X	X
*(2) Ubay	O	O	O	O	O	X
5. Zone 5						
*(1) Surigao City	O	X	X	O	O	X
(2) Bacuag	X	X	X	O	X	X
(3) Claver	X	X	X	O	X	X
(4) Dapa	X	X	X	O	X	X
(5) Placer	X	X	X	O	X	X
(6) Malimono	X	X	X	O	X	X
(7) San Francisco	X	X	X	O	X	X
6. Zone 6						
*(1) Gen. Santos	O	O	O	O	O	X
(2) Suralah	X	X	X	O	X	X
7. Zone 7						
*(1) Pagadian City	O	O	O	O	O	X
(2) Margosa Tubig	X	X	X	O	X	X
(3) Naga	X	X	X	O	X	X
(4) Payao	X	X	X	O	X	X
(5) San Pablo	X	X	X	O	X	X
(6) Tukuran	X	X	X	O	X	X
8. Zone 8						
*(1) Himamaylan	O	O	O	O	O	X
(2) Binalbagan	X	X	X	O	X	X
(3) Hinigaran	X	X	X	O	X	X
(4) Ilog	X	X	X	O	X	X
9. Zone 9						
(1) Sindangan	X	X	X	O	X	X
*(2) Ponot	O	O	O	O	O	X
(3) P. M. Roxas	X	X	X	O	X	X
10. Zone 10						
(1) Poon A Bayabao	X	X	X	O	X	X
(2) Ganassi	X	X	X	O	X	X
*(3) Marawi City	O	X	X	O	O	X
11. Zone 11						
(1) Buluan	X	X	X	O	X	X
(2) Cotabato City	X	X	X	O	X	X
*(3) Datu Piang	O	X	X	O	O	X
(4) Dinaig	X	X	X	O	X	X

Remarks: (1) *: Zone center.
(2) Components (Facilities/equipment) o: Required ×: Not required
(3) In Hagonoy, MFP will be completed by MPWH and there is no need for land reclamation and consolidation by the zone system.
(4) Land reclamation/consolidation and access road were excluded from the system components, being the responsibility of the local government.

Table 8.9 MAJOR COMPONENTS OF FACILITIES AND EQUIPMENT BY ZONE SYSTEM (Continued)

Zone	(B) Supporting Facilities						
	Ice Transport Vehicle Vessel	Spare Parts	Warehouse for Spare Parts	Workshop & Equipment	Management Office	Lodging House	Communication Equipment
1. Zone 1							
(1) Abucay	X	O	X	X	O	X	O
(2) Samal	X	O	X	X	O	X	O
*(3) Hagonoy	O	O	O	O	O	O	O
(4) Obando	X	O	X	X	O	X	O
(5) Masinloc	X	O	X	X	O	X	O
2. Zone 2							
*(1) Sta. Elena	O	O	O	O	O	O	O
(2) MFP in Sta. Elena	X	O	X	X	O	X	O
(3) J. Panganiban	X	O	X	X	O	X	O
(4) Capalonga	X	O	X	X	O	X	O
(5) Mercedes	X	O	X	X	O	X	O
3. Zone 3							
(1) Concepcion	X	O	X	X	O	X	O
(2) San Dionisio	X	O	X	X	O	X	O
*(3) Estancia	O	O	O	O	O	O	O
(4) Ajui	X	O	X	X	O	X	O
(5) Carles	X	O	X	X	O	X	O
(6) Panay	X	O	X	X	O	X	O
4. Zone 4							
(1) Tagbilaran	X	O	X	X	O	X	O
*(2) Ubay	O	O	O	O	O	O	O
5. Zone 5							
*(1) Surigao City	O	O	O	O	O	O	O
(2) Bacuag	X	O	X	X	O	X	O
(3) Claver	X	O	X	X	O	X	O
(4) Dapa	X	O	X	O	O	X	O
(5) Placer	X	O	X	X	O	X	O
(6) Malimono	X	O	X	X	O	X	O
(7) San Francisco	X	O	X	X	O	X	O
6. Zone 6							
*(1) Gen. Santos	O	O	O	O	O	O	O
(2) Suralah	X	O	X	X	O	X	O
7. Zone 7							
*(1) Pagadian City	O	O	O	O	O	O	O
(2) Margosa Tubig	X	O	X	X	O	X	O
(3) Naga	X	O	X	X	O	X	O
(4) Payao	X	O	X	X	O	X	O
(5) San Pablo	X	O	X	X	O	X	O
(6) Tukuran	X	O	X	X	O	X	O
8. Zone 8							
*(1) Himamaylan	O	O	O	O	O	O	O
(2) Binalbagan	X	O	X	X	O	X	O
(3) Hinigaran	X	O	X	X	O	X	O
(4) Ilog	X	O	X	X	O	X	O
9. Zone 9							
(1) Sindangan	X	O	X	X	O	X	O
*(2) Ponot	O	O	O	O	O	O	O
(3) P. M. Roxas	X	O	X	X	O	X	O
10. Zone 10							
(1) Poon A Bayabao	X	O	X	X	O	X	O
(2) Ganassi	X	O	X	X	O	X	O
*(3) Marawi City	O	O	O	O	O	O	O
11. Zone 11							
(1) Buluan	X	O	X	X	O	X	O
(2) Cotabato City	X	O	X	X	O	X	O
*(3) Datu Piang	O	O	O	O	O	O	O
(4) Dinaig	X	O	X	X	O	X	O

Table 8.9 MAJOR COMPONENTS OF FACILITIES AND EQUIPMENT BY ZONE SYSTEM (Completed)

Zone	(C) Infrastructure				
	Land Reclamation/ Consolidation	Tube-well & other water supply Facility	Electric distribution line	Parking Lot	Access Road
1. Zone 1					
(1) Abucay	X	X	O	O	X
(2) Samal	X	X	O	O	X
*(3) Hagonoy	X	O	O	O	O
(4) Obando	X	X	O	X	X
(5) Masinloc	X	X	O	O	X
2. Zone 2					
*(1) Sta. Elena	O	O	O	O	X
(2) MFP in Sta. Elena	X	X	O	O	X
(3) J. Panganiban	X	X	O	O	X
(4) Capalonga	X	X	O	O	X
(5) Mercedes	X	X	O	O	X
3. Zone 3					
(1) Concepcion	X	X	O	O	X
(2) San Dionisio	X	X	O	O	X
*(3) Estancia	O	O	O	O	O
(4) Ajui	X	X	O	O	X
(5) Carles	X	X	O	O	X
(6) Panay	X	X	O	O	X
4. Zone 4					
(1) Tagbilaran	X	X	O	O	X
*(2) Ubay	O	O	O	O	X
5. Zone 5					
*(1) Surigao City	X	O	O	O	X
(2) Bacuag	X	X	O	O	X
(3) Claver	X	X	O	O	X
(4) Dapa	X	X	O	O	X
(5) Placer	X	X	O	O	X
(6) Malimono	X	X	O	O	X
(7) San Francisco	X	X	O	O	X
6. Zone 6					
*(1) Gen. Santos	X	O	O	O	X
(2) Suralah	X	X	O	O	X
7. Zone 7					
*(1) Pagadian City	O	O	O	O	O
(2) Margosa Tubig	X	X	O	O	X
(3) Naga	X	X	O	O	X
(4) Payao	X	X	O	O	X
(5) San Pablo	X	X	O	O	X
(6) Tukuran	X	X	O	O	X
8. Zone 8					
*(1) Himamaylan	X	O	O	O	X
(2) Binalbagan	X	X	O	O	X
(3) Hinigaran	X	X	O	O	X
(4) Ilog	X	X	O	O	X
9. Zone 9					
(1) Sindangan	X	X	O	O	X
*(2) Ponot	X	O	O	O	X
(3) P. M. Roxas	X	X	O	O	X
10. Zone 10					
(1) Poon A Bayabao	X	X	O	O	X
(2) Ganassi	X	X	O	O	X
*(3) Marawi City	X	O	O	O	X
11. Zone 11					
(1) Buluan	X	X	O	O	X
(2) Cotabato City	X	X	O	O	X
*(3) Datu Piang	X	O	O	O	X
(4) Dinaig	X	X	O	O	X

9. PHYSICAL PLAN

9. PHYSICAL PLAN

The physical plan was formulated for the zone system and the prototype system according to the following basic principles:

(1) Area of the facilities

The area of the basic facilities such as ice making plant, ice storage, cold storage, freezer, machine room and ice delivery/anteroom, was determined to meet the planned plant capacity.

The area of the administration office and the lodging house was determined so as to accommodate the planned number of employees and an additional space was provided for a warehouse for spare parts.

(2) Land

The land for zone centers was proposed by the respective municipal governments in Zones 1, 2, 3, 4 and 6. A reconnaissance survey was conducted to clarify the suitability and topographical conditions of the proposed land.

Site inspection was not conducted for the rest of the selected zones, because of the limitation of the survey period and not proposed in the preliminary study by PFDA. For these zones, it was assumed that the municipal government would propose the area required for the plant capacity and a level land in each zone.

(3) Infrastructure

a. Road

The accessibility from the zone centers to the trunk roads was surveyed on the spot for the 5 zones during the Study. There is no data on the accessibility from the zone center to the trunk road for the other 6 zones. For these zones, it was assumed that the centers would be located along the trunk road.

b. Water supply

Sources of water were identified and also the length of the piping from the zone centers to the water sources for 5 zones was estimated based on the interview survey. Water treatment facilities would be installed, should there be any water quality problem. For the other 6 zones, it was assumed that water would be supplied by deep wells to be developed in the zone centers.

c. Power supply

Power will be supplied to the zone centers by installing transformer and service lines from the main power line of the respective electric cooperatives. Reserve generators are to be installed in each of the zone center, in view of the unstable power supply in the Philippines, e.g., frequent voltage fluctuations and brownout.

(4) Layout of buildings

Various buildings are arranged in the zone center in such a way as loading and delivery of ice and fish by trucks are conducted without congestion. Rooms of buildings are also arranged to ensure effective loading and unloading operations of ice and fish, taking account of topogrpahical conditions.

(5) Buildings

a. Structure

Structural steel and insulation panels will be used instead of reinforced concrete construction for the following reasons:

(i) Light weight
(ii) Short construction period
(iii) Easy installation
(iv) Easy repair and replacement of panels
(v) Standardized materials of high quality for insulation and humidity resistance

The structural steel and insulation panel construction is the same as that of the Iloilo Regional Fishing Port, being different from the reinforced concrete construction of PFDA ice plants and cold storages transferred from BFAR.

b. Building floors are of elevated platform style for the convenience of loading/unloading of ice/fish and for protection against flood and high moisture. This style was adopted in PFDA plants transferred from BFAR, while in the case of the Iloillo Regional Fishing Port the floor and ground are almost on the same level.

c. In the case of cold storages of bigger capaciy, the fork-lift and pallet loading method for frozen fish was adopted in view of the effective handling of frozen fish and saving of room space in cold storages.

d. Ice stackers were adopted for ice storages of big capacity for the same reasons as c.

(6) Machinery

a. Ammonia would be used as refrigerant, as it is most economical and popular at present in the Philippines.

b. Multi-cylinder type (MCT) compressors would be used instead of the old fashioned vertical open type (VOT), considering the conveniene of maintenane and availability of spare parts for compressors of different capacities. And, evaporative condensers would be installed for energy saving and safety. The modern type machinery has been installed in IPCS of NFPC, Iloilo Regional Fishing Port and the PFDA plant recently constructed.

10. COST ESTIMATION

10. COST ESTIMATION

The construction cost was estaimated based on the following assumptions:

a. Constant price as of June 1984 and no price rise assumed.

b. Procurement through international competitive bidding

c. No duties on imported materials and goods

d. Foreign exchange rate of US 1 dollar equivalent to 18 pesos or 240 yen

e. Unit cost was estimated by item based upon the data provided by the main office of MPWH in Manila, District Engineering Office and by private contractors in respective provinces and Metro Manila. Unit costs obtained through interview survey are shown in Table 10.1 on buildings and in Table 10.2 on civil engineering works.

f. Costs of imported materials and goods were estimated at CIF price in Manila and include additional transportation costs from Manila to the proposed sites.

g. Costs of the ground work in 6 zone centers which were not inspected were estimated, assuming the same conditions as in the zone center of General Santos City in South Cotabato.

h. Average wage of skilled and unskilled laborers was estimated based upon the data obtained through interviews with local private contractors.

i. Engineering fee was estimated at 10% of the total cost of civil/building/plant works and transportation/communication facilities.

j. Physical contingency was assumed to be 30% of the total construction cost.

The constrution cost was estimated as shown in Tables 10.3 to 10.6.

Table 10.1 UNIT COST OF BUILDING

Unit: ₱/m²

Private contractors interviewed	Luzon	Visayas	Mindano
1. Industrial building for basic facilities of IPCS (Structural steel)			
a. Corp. A	3800	4636	4266
b. Corp. B	3350	3850	4015
c. Corp. C	3800	3900	4000
d. Corp. D	3000	3000	3000
Average	3488	3847	3820
2. Housing for supply facilities of IPCS (2nd class)			
a. Corp. A	2250	2130	2090
b. Corp. B	3350	3850	3980
c. Corp. C	3000	3100	3200
d. Corp. D	2500	2500	2500
Average	2775	2895	2943

Remarks: (1) Price as of June, 1984.
(2) Data were provided by local private contractors in Aug., 1984.

Table 10.2 UNIT COST OF CIVIL WORKS

Work item	Unit	Unit Price		
		Luzon	Visayas	Mindanao
1. Ground and drainage works	₱/m³	35.00	37.00	39.00
2. Waste excavation works and backfill	₱/m³	65.00	68.00	72.00
3. Reclamation works	₱/m³	178.00	187.00	196.00
4. Asphaltic concrete pavement works	₱/m²	214.00	225.00	236.00
5. Well drilling works	₱/m	637.00	669.00	701.00
6. Water piping works	₱/m	709.00	745.00	780.00

Remarks: (1) Prices as of June, 1984.
(2) Data were provided by MPWH, CITY ENG'R OFFICE and private contractors in NCR and provincial areas.

Table 10.3 TOTAL CONSTRUCTION COST

UNIT: ₱10³

Zone and Prototype	1990			1990 ~ 2000			Total		
	F.P.	L.P.	Total	F.P.	L.P.	Total	F.P.	L.P.	Total
Zone system									
1) Zone 1	20,882	2,170	23,052	18,756	1,049	19,805	39,638	3,219	42,857
2) Zone 2	30,399	11,194	41,593	–	–	–	30,399	11,194	41,593
3) Zone 3	45,053	10,167	55,220	12,185	1,002	13,187	57,238	11,169	68,407
4) Zone 4	17,849	4,809	22,658	14,790	1,130	15,920	32,639	5,939	38,578
5) Zone 5	39,497	4,696	44,193	–	–	–	39,497	4,696	44,193
6) Zone 6	22,745	5,473	28,218	34,679	3,431	38,110	57,424	8,904	66,328
7) Zone 7	59,591	8,059	67,650	28,636	3,697	32,333	88,227	11,756	99,983
8) Zone 8	44,342	5,665	50,007	12,258	1,227	13,485	56,600	6,892	63,492
9) Zone 9	59,943	8,256	68,199	24,840	3,073	27,913	84,783	11,329	96,112
10) Zone 10	24,124	2,900	27,024	–	–	–	24,124	2,900	27,024
11) Zone 11	43,315	8,256	51,571	–	–	–	43,315	8,256	51,571
Sub total	407,740	71,645	479,385	146,144	14,609	160,753	553,884	86,254	640,138
Prototype system									
1) 1 (t/d) type	55,974	4,446	60,420	–	–	–	55,974	4,446	60,420
2) 3 (t/d) type	23,400	2,400	25,800	–	–	–	23,400	2,400	25,800
3) 5 (t/d) type	16,053	1,674	17,728	–	–	–	16,053	1,674	17,727
4) 10 (t/d) type	69,504	5,694	75,198	–	–	–	69,504	5,694	75,198
5) 15 (t/d) type	191,506	16,730	208,236	–	–	–	191,506	16,730	208,236
6) 1 (t/d) movile type	3,384	225	3,609	–	–	–	3,384	225	3,609
Sub total	359,821	31,169	390,990	–	–	–	359,821	31,169	390,990
Total	767,561	102,814	870,375	146,144	14,609	160,753	913,705	117,423	1,031,128

Remarks: (1) Index: F.P. = Foreign portion, L.C. = Local portion.
(2) Cost were estimated at constant price as of June, 1984.
(3) Cost were estimated in the case of international competitive bidding.
(4) Foreign exchange rate of US$1 is equivalent to ₱18 or ¥240.

Table 10.4 CONSTRUCTION COST BY ZONE AND BY COST COMPONENTS

UNIT: ₱10³

Cost component	1990			1990 – 2000			Total		
	F.P.	L.P.	Total	F.P.	L.P.	Total	F.P.	L.P.	Total
Zone 1									
1. Civil works	230	276	506	–	–	–	230	276	506
2. Bldg. works	6,352	1,086	7,438	5,479	621	6,100	11,831	1,707	13,538
3. Plant works	4,938	54	4,992	6,870	81	6,951	11,808	135	11,943
4. Transportation & communication system	3,083	71	3,154	767	32	799	3,850	103	3,953
5. Land acquisition	–	33	33	–	–	–	–	33	33
6. Engineering service	1,460	149	1,609	1,312	73	1,385	2,772	222	2,994
7. Physical contigency	4,819	501	5,320	4,328	242	4,570	9,147	743	9,890
Total	20,882	2,170	23,052	18,756	1,049	19,805	39,638	3,219	42,857
Zone 2									
1. Civil works	2,051	5,779	7,830	–	–	–	2,051	5,779	7,830
2. Bldg. works	7,593	1,536	9,129	–	–	–	7,593	1,536	9,129
3. Plant works	9,321	251	9,572	–	–	–	9,321	251	9,572
4. Transportation & communication system	2,293	71	2,364	–	–	–	2,293	71	2,364
5. Land acquisition	–	210	210	–	–	–	–	210	210
6. Enginering service	2,126	764	2,890	–	–	–	2,126	764	2,890
7. Physical contigency	7,015	2,583	9,598	–	–	–	7,015	2,583	9,598
Total	30,399	11,194	41,593	–	–	–	30,399	11,194	41,593
Zone 3									
1. Civil works	728	4,033	4,761	–	–	–	728	4,033	4,761
2. Bldg. works	10,498	2,351	12,849	4,578	578	5,156	15,076	2,929	18,005
3. Plant works	15,113	384	15,497	3,176	50	3,226	18,289	434	18,723
4. Transportation & communication system	5,166	89	5,255	767	73	840	5,933	162	6,095
5. Land acquisition	–	278	278	–	–	–	–	278	278
6. Engineering service	3,151	686	3,837	852	70	922	4,003	756	4,759
7. Physical contigency	10,397	2,346	12,743	2,812	231	3,043	13,209	2,577	15,786
Total	45,053	10,167	55,220	12,185	1,002	13,187	57,238	11,169	68,407
Zone 4									
1. Civil works	285	2,026	2,311	–	–	–	285	2,026	2,311
2. Bldg. works	5,450	1,152	6,602	4,500	668	5,168	9,950	1,820	11,770
3. Plant works	5,503	110	5,613	5,843	122	5,965	11,346	232	11,578
4. Transportation & communication system	1,244	37	1,281	–	–	–	1,244	37	1,281
5. Land acquisition	–	41	41	–	–	–	–	41	41
6. Engineering service	1,248	333	1,581	1,034	79	1,113	2,282	412	2,694
7. Physical contigency	4,119	1,110	5,229	3,413	261	3,674	7,532	1,371	8,903
Total	17,849	4,809	22,658	14,790	1,130	15,920	32,639	5,939	38,578
Zone 5									
1. Civil works	285	619	904	–	–	–	285	619	904
2. Bldg. works	9,133	1,969	11,102	–	–	–	9,133	1,969	11,102
3. Plant works	11,141	183	11,324	–	–	–	11,141	183	11,324
4. Transportation & communication system	7,061	139	7,200	–	–	–	7,061	139	7,200
5. Land acquisition	–	411	411	–	–	–	–	411	411
6. Engineering service	2,762	291	3,053	–	–	–	2,762	291	3,053
7. Physical contigency	9,115	1,084	10,199	–	–	–	9,115	1,084	10,199
Total	39,497	4,696	44,193	–	–	–	39,497	4,696	44,193
Zone 6									
1. Civil works	285	1,059	1,344	–	–	–	285	1,059	1,344
2. Bldg. works	7,398	1,675	9,073	9,504	1,748	11,252	16,902	3,423	20,325
3. Plant works	6,585	393	6,978	13,980	619	14,599	20,565	1,012	21,577
4. Transportation & communication system	1,637	52	1,689	767	32	799	2,404	84	2,488
5. Land acquisition	–	713	713	–	–	–	–	713	713
6. Engineering service	1,591	318	1,909	2,425	240	2,665	4,016	558	4,574
7. Physical contigency	5,249	1,263	6,512	8,003	792	8,795	13,252	2,055	15,307
Total	22,745	5,473	28,218	34,679	3,431	38,110	57,424	8,904	66,328
Zone 7									
1. Civil works	285	709	994	–	–	–	285	709	994
2. Bldg. works	15,201	3,333	18,534	11,608	2,052	13,660	26,809	5,385	32,194
3. Plant works	19,191	448	19,639	7,650	170	7,820	26,841	618	27,459
4. Transportation & communication system	6,995	183	7,178	767	363	1,130	7,762	546	8,308
5. Land acquisition	–	1,059	1,059	–	–	–	–	1,059	1,059
6. Engineering service	4,167	467	4,634	2,003	259	2,262	6,170	726	6,896
7. Physical contigency	13,752	1,860	15,612	6,608	853	7,461	20,360	2,713	23,073
Total	59,591	8,059	67,650	28,636	3,697	32,333	88,227	11,756	99,983
Zone 8									
1. Civil works	285	749	1,034	–	–	–	285	749	1,034
2. Blgd. works	10,135	2,230	12,365	4,629	734	5,363	14,764	2,964	17,728
3. Plant works	17,968	391	18,359	3,176	51	3,227	21,144	442	21,586
4. Transportation & communication system	2,620	55	2,675	767	73	840	3,387	128	3,515
5. Land acquisition	–	590	590	–	–	–	–	590	590
6. Engineering service	3,101	343	3,444	857	86	943	3,958	429	4,387
7. Physical contigency	10,233	1,307	11,540	2,829	283	3,112	13,062	1,590	14,652
Total	44,342	5,665	50,007	12,258	1,227	13,485	56,600	6,892	63,492
Zone 9									
1. Civil works	285	658	943	–	–	–	285	658	943
2. Bldg. works	15,971	3,709	19,680	10,439	1,763	12,202	26,410	5,472	31,882
3. Plant works	21,637	443	22,080	6,165	131	6,296	27,802	574	28,376
4. Transportation & communication system	4,025	97	4,122	767	255	1,022	4,792	352	5,144
5. Land acquisition	–	953	953	–	–	–	–	953	953
6. Engineering service	4,192	491	4,683	1,737	215	1,952	5,929	706	6,635
7. Physical contingency	13,833	1,905	1,5738	5,732	709	6,441	19,565	2,614	22,179
Total	59,943	8,256	68,199	24,840	3,073	27,913	84,783	11,329	96,112
Zone 10									
1. Civil works	230	161	391	–	–	–	230	161	391
2. Bldg. works	6,102	1,304	7,406	–	–	–	6,102	1,304	7,406
3. Plant works	7,918	206	8,124	–	–	–	7,918	206	8,124
4. Transportation & communication system	2,620	72	2,692	–	–	–	2,620	72	2,692
5. Land acquisition	–	314	314	–	–	–	–	314	314
6. Engineering service	1,687	174	1,861	–	–	–	1,687	174	1,861
7. Physical contigency	5,567	669	6,236	–	–	–	5,567	669	6,236
Total	24,124	2,900	27,024	–	–	–	24,124	2,900	27,024
Zone 11									
1. Civil works	285	637	922	–	–	–	285	637	922
2. Bldg. works	13,223	2,739	1,5962	–	–	–	13,223	2.739	15,962
3. Plant works	11,001	284	11,285	–	–	–	11,001	284	11,285
4. Transportation & communication system	5,781	1,500	7,281	–	–	–	5,781	1,500	7,281
5. Land acquisition	–	675	675	–	–	–	–	675	675
6. Engineering service	3,029	516	3,545	–	–	–	3,029	516	3,545
7. Physical contigency	9,996	1,905	11,901	–	–	–	9,996	1,905	11,901
Total	43,315	8,256	51,571	–	–	–	43,315	8,256	51,571

Table 10.5 TOTAL CONSTRUCTION COST BY PROTOTYPE

UNIT: ₱10³

Type in ice plant capacity	Number of site	Unit cost by type			Total cost		
		F.P.	L.P.	Total	F.P.	L.P.	Total
1 (t/d)	19	2,946	234	3,180	55,974	4,446	60,420
3 (t/d)	6	3,900	400	4,300	23,400	2,400	25,800
5 (t/d)	3	5,351	558	5,909	16,053	1,674	17,727
10 (t/d)	6	11,584	949	12,533	69,504	5,694	75,198
15 (t/d)	14	13,679	1,195	14,874	191,506	16,730	208,236
1 (t/d) Mobile	4*	3,384	225	3,609	3,384	225	3,609
Total	52	–	–	–	359,821	31,169	390,990

Remarks: (1) Refer to Table 10.3.
(2) *: 4 sites will be covered by 1 mobile plant.

Table 10.6 CONSTRUCTION COST OF PROTOTYPE BY TYPE AND BY COST COMPONENTS

Unit: ₱ Unit: ₱10³

Cost components	1 (t/d) Type			3 (t/d) Type			5 (t/d) Type		
	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total
1) Civil works	–	–	–	–	–	–	–	–	–
2) Bldg. works	754	143	897	1,106	254	1,360	1,524	357	1,881
3) Plant works	1,311	21	1,332	1,621	26	1,647	2,218	33	2,251
4) Transportation & communication system	–	–	–	–	–	–	–	–	–
5) Land acquisition	–	–	–	–	–	–	–	–	–
6) Engineering service	201	16	217	273	28	301	374	39	413
7) Physical contigency	680	54	734	900	92	992	1,235	129	1,364
Total	2,946	234	3,180	3,900	400	4,300	5,351	558	5,909

Cost components	10 (t/d) Type			15 (t/d) Type			1 (t/d) Mobile Type		
	F.C.	L.C.	Total	F.C.	L.C.	Total	F.C.	L.C.	Total
1) Civil works	–	–	–	–	–	–	–	–	–
2) Bldg. works	3,163	555	3,718	3,706	704	4,410	629	153	782
3) Plant works	4,938	109	5,047	5,859	131	5,990	1,737	4	1,741
4) Transportation & communication system	–	–	–	–	–	–	–	–	–
5) Land acquisition	–	–	–	–	–	–	–	–	–
6) Engineering service	810	66	876	957	84	1,041	237	16	253
7) Physical contigency	2,673	219	486	3,157	276	3,433	781	52	833
Total	11,584	949	12,533	13,679	1,195	14,874	3,384	225	3,609

Remarks: Refer to Table 10.3.

11. ECONOMIC AND FINANCIAL EVALUATION

11. ECONOMIC AND FIANCIAL EVALUATION

11.1 Basic Principles

The Nationwide IPCS Network System, composed of the zone and the prototype systems was evaluated from the viewpoints of its contribution to the national economy and its financial viability. it was evaluated with respect to the net present value (NPV), benefit/cost ratio (B/C) and economic internal rate of return (EIRR). A financial analysis was also made based on the income statement and cash flow.

The Study Team was handicapped by the lack of information on the pricing of fish and ice. However, the economic and financial viability of the project was confirmed through a sensitivity analysis. Further study is required on the relationships between deterioration of fish quality in the course of fishing and marketing, and price changes.

11.2 Economic Evaluation

(1) Benefits

Economic benefits to be brought by the IPCS System will be composed of direct and indirect ones as follows:

a. Direct benefits

(i) Reduction of fish spoilage
(ii) Shifting the time and location of fish sales
(iii) Increase of fish exports

b. Indirect benefits

(i) Income increase of fishermen due to upgrading of value of fish
(ii) Development and effective use of fisheries resources
(iii) Creation of employment opportunities
(iv) Acceleration of rural development
(v) Acquisition of new techniques and organizing fishermen's association
(vi) Effective use of MFP

(2) Project cost

The project cost is composed of the construction cost, operation and maintenance cost and replacement cost. In the zone system, the project cost includes the cost for infrastructure development as well as basic and supporting facilities, while in the case of the prototype system, the cost for the package plant consisting of the basic and limited supporting facilities is included but the cost for infrastructure development is excluded.

The economic cost, however, includes all the indispensable costs required for generating benefits, i.e., costs of not only the said facilities but also the other relevant infrastructure development. Transfer payments within the national economy such as interest, insurance and tax are excluded from the financial cost. The operation cost is composed of electricity/fuel cost, salary/wages, transportation and miscellaneous costs.

(3) Evaluation

The economic evaluation was conducted based on the following assumptions and basic data.

a. Project life

The physical life was assumed to be 20 years for machinery and 30 years for buildings. However, the project life was assumed to last until 2020 over the target year of the Nationwide IPCS Network System, 2000.

b. Discount rate

The discount rate was assumed to be 20% based upon the interest rates of national bonds and the long term bank loans in the country.

c. Prices

All costs and benefits are indicated at the constant prices of 1984.

d. Benefits from the plant

The quality deterioration of fish by time with ice was estimated applying an expotential curve based upon the data of "Fish Marketing in Three Landing Areas, Iloilo, Bacolod and Zamboanga, Feb. 1978, BAECON and BFAR", as shown in Table 11.1 and Fig. 11.1.

Freshness of fish, through quality deterioration without use of ice, was estimated as follows at fishing/harvesting and marketing/transportation stages.

(i) At fishing/harvesting stage:

commercial fisheries	:	65%
municipal fisheries	:	90% (0% for Zone 6)
aquaculture	:	93%

(ii) At marketing/transportation stage:

within the province	:	85%
out of the province	:	70%

The average fish price in each zone was estimated as shown in Table 11.2, and the quantity of fish which will benefit from ice produced by the project is as shown in Table 11.3. Benefits to be derived from the project were estimated for 1990 and 2000 as shown in Table 11.4.

e. Benefits from cold storages

Benefits from cold storage are estimated for fish both for domestic consumption and for export.

Regarding domestic consumption, surplus fish in the peak season, when the fish price falls, will be stored in cold storages and be sold later when the price rises or in other areas where the price is favourable. In other words, benefits from cold storages are the possibility of controlling seasonal and geographical unbalance of fish supply and demand. The seasonal fluctuation by Region and Regional differences of fish prices by species are shown in Tables 11.5 and 11.6. The benefits were estimated to raise the value of fish by P3.6/kg through the year, i.e., an increase in fish price by 35% over the annual average price. The increased price of fish by ice supply through the project corresponds to the net income increase of fishermen or other fish suppliers. Because of the small quantities of fish benefited from cold storage of this project, this price change will not interrupt the existing prevalent market price of fish in the domestic market and consumers will never suffer from raising fish prices.

Regarding fish exports, benefits to be derived will be the difference between the export price and the wholesale price as shown in Tables 11.7 and

11.8. Export benefits were estimated as P2.4/kg of fish exported. The quantity of fish which will be stored in cold torages is shown in Table 11.9, and the economic benefits to be derived from cold storages were estimated as shown in Table 11.10.

f. Economic cost

The economic costs for construction for the zone and the prototype system are shown in Table 11.11. The maintenance costs were assumed to be constant each year, accounting for 5% for machinery, 3% for buildings and 1% for the infrastructure. The operation and maintenance costs were estimated as shown in Table 11.12.

g. Economic evaluation

As shown in Table 11.13, the net present value (NPV; present value of benefit - present value of cost) of the total project was estimated at $P641 \times 10^6$ at 20% of annual discount rate. The benefit/cost ratio (B/C) was calculated at 1.50 and the economic internal rate of return (EIRR) was to be 33.9%.

Further, a sensitivity test of EIRR in response to the change of costs and benefits was carried out as shown in Table 11.14. EIRR was estimated to be 20%, which corresponds to the annual discount rate, even if the benefit is 20% lower and the cost is 20% higher compared with those of the above mentioned conditions.

11.3 Financial Evaluation

In the financial evaluation, it was assumed that soft loans from foreign lending agencies would be available for the foreign currency portion of the construction cost. Loan conditions of the foreign soft loan would include a 5% interest rate per annum, 5 years of grace period and 20 years of amortization period including the grace period.

The physical life of machinery is 20-years and that of buildings is 30-years. Depreciation was calculated by the fixed installment method. Machinery will be replaced within the project life up to 2020, upon the completion of their physical life.

Revenues of the project will arise from ice sales, freezing and storage of fish.

Fish prices rose greatly only within half a year from January 1984 of Phase I Study to July of Phase II Study due to pesos devaluation and inflation. However, the ice price remained at the same level during that period, because of the temporarily decreased production of fish and the delay of the effect of inflation into the price of ice.

Market prices of ice will rise, when fish is kept in good quality and increase its value. On this assumption, the price of ice was assumed to be 1.5 to 2.0 times the present price in real terms. Market prices of ice by zone in 1984 are shown in Table 11.15.

Average charges for storing frozen fish were assumed to be ₱3.6/kg/time for domestic consumption and ₱2.4/kg/time for exports, considering the increase in fish value due to the introduction of cold storages.

A sensitivity test was made to evaluate the financial viability of the System, because of the unpredictability of vairous factors affecting ice and fish prices. Income statements and the cash flow are shown in Tables 11.16 to 11.19.

The zone system is viable from the financial point of view, assuming the price increase of ice resulting from the increased fish value owing to sufficient supply of ice contrary to the case of ice shortage which may lead to low quality of fish.

However, the prototype system will not be necessarily viable financially because of the comparatively high construction and operation costs with the low demand for IPCS.

Since IPCS is only a part of an integrated program composed of MFP, IPCS and FTS, its financial viability might improve with the inclusion of MFP and FTS.

Both of the zone and the prototype systems should be constructed to achieve the national target, i.e., attainment of food self-sufficiency and income increase of municipal fishermen, even in the case that the prototype system is not viable from the financial point of view.

If the priority of the Government of the Philippines is placed on financial viability rather than the achievement of the said national target, the following alternatives may be considered:

a. To delay the construction of the prototype system by 10 years.

b. To construct 15 ton ice plants only.

c. To exclude one (1) ton ice plants.

d. To reduce construction costs by using indigenous building materials.