Global Positioning system (GPS) Data
Souria Kedima

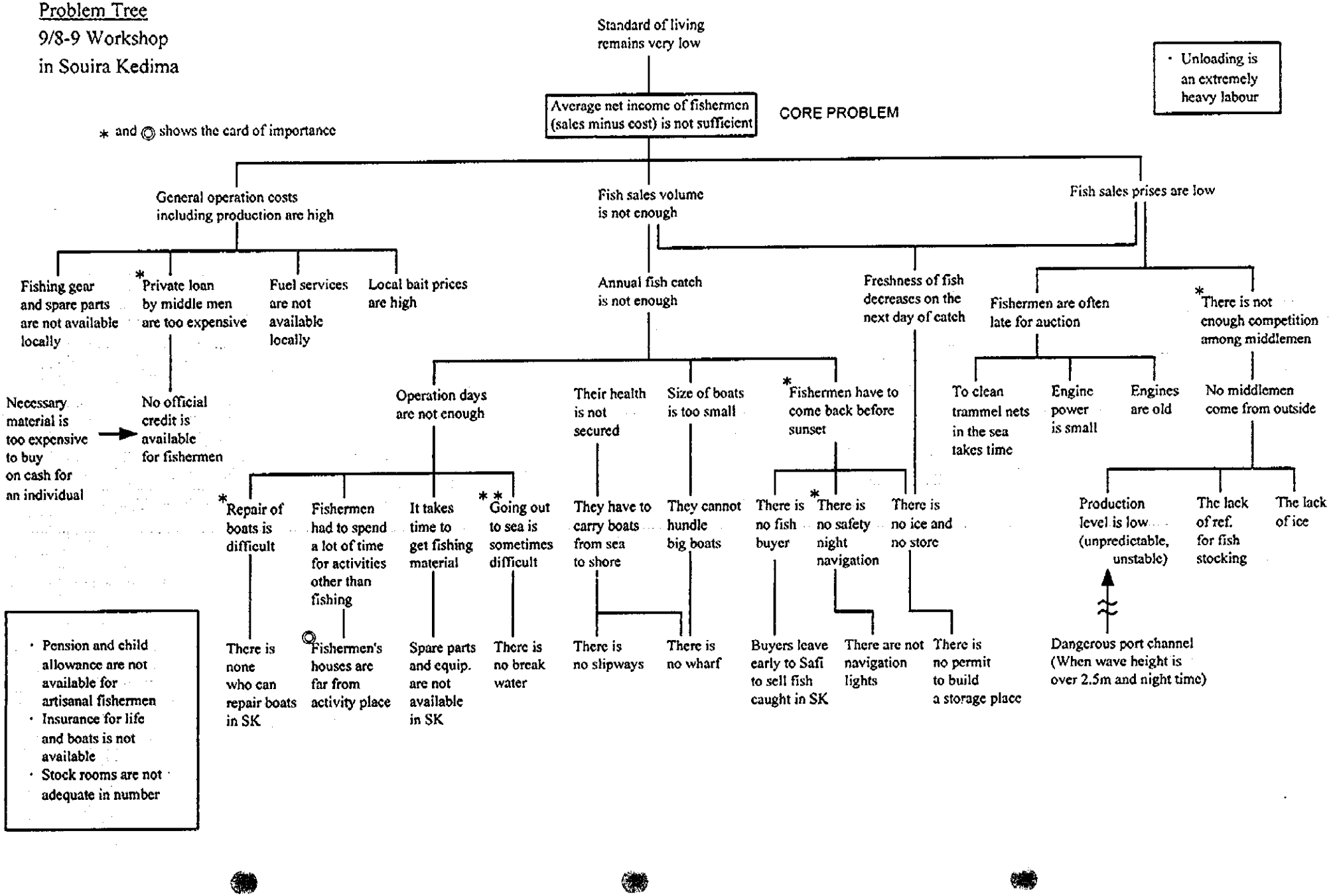
Location	Latitude	longitude	Location indicator or name	Bottom material (Sand=S, Rock=R)	Depth m	Temp. ℃	Observation
LKM1	32° 02′ 62 N	009° 20′ 72 W	Souira Kedima (SK) Beach				
LKM2-1	32° 02′ 02 N	009° 21′ 45 W	Just out side of chanel	S	6.7	21.4	13 boats(3 FM each) hand line, fishing far
LKM2-2	32° 04′ 45 N	009° 21′ 01 W	North of SK	R & S	21	21.4	Gill nets were located. Signs of pelagic fish in the fish finder
LKM2-3	32° 05′ 14 N	009° 21′ 21 W					A boat from SK was fishing.
LKM2-4	32° 11′ 36 N	009° 18′ 18 W		S			A trawl boat was found off shore
LKM3-1	32° 11′ 76 N	009° 17′ 84 W	Off Alou du complex ou Smamad	R	30	21.5	
LKM3-2	32° 11′ 84 N	009° 18′ 49 W					Acoastal long line boat was on her way to the southern fishing ground
LKM3-3	32° 11′ 39 N	009° 18′ 53 W		S	32		A trawl boat was fishing here
LKM3-4	32° 11′ 27 N	009° 20′ 30 W		S	35		The complex is being out of sight
LKM4	32° 09′ 40 N	009° 24′ 42 W	Alou du Smamad	R	42	21.5	A hand line fishermen from Safi, SK is 170° direction
LKM5	32° 02′ 62 N	009° 20′ 73 W	Souira Kedima (SK) Beach				Return to SK, GPS was confrimed to be exact.
LKM6	32° 01′ 18 N	009° 29′ 65 W	South of SK	R	35	21.5	Trammel nets were located.
LKM7	32° 02′ 45 N	009° 29′ 84 W	Sekint	R	36	21.4	Trammel nets were located. Homard Octopus, Grondin were caught by fishermen.
LKM8	32° 02′ 37 N	009° 29′ 71 W		R	36	21.7	Trammel nets were located. Homard were caught by fishermen.
LKM9	32° 03′ 50 N	009° 30′ 42 W		R			A hand line fishing boat from SK.
LKM10	32° 00′ 53 N	009° 22′ 53 W	Near the shore line	R & S	< 10		Trolling fishing groud for Loup.

Fishing Ground Information of Souira Kedima

Fishing ground A is for trammel net and botom long line and shared with Safi fishermen. The fishing ground is known as "Alou du Complex ou Smamad" 2 to 3 hours from SK.
Fishing ground B is for gill net fishng. Fishing boat with 8 HP engine usually operate here. Those with 15 HP go farther fishing grounds.
Fishing ground C is just used by SK fishermen using trammel net and bottom long line. This fishing ground is known as "Ras El Rhaba"
Fishing ground D is just used by SK fishermen using trammel net and bottom long line. This fishing ground is known as "Douar El Maaz" 2 to 3 hours from SK.
Fishing ground E is shared with Imsouane fishermen. 4 hours from SK. This fishing ground is known as "Ras Daoura"
Fishing ground F is shallow near shore area for trolling. It is known as "Foum Oued"

Problem Tree

9/8-9 Workshop
in Souira Kedima



Objective Tree
9/10 Workshop
in Souira Kedima

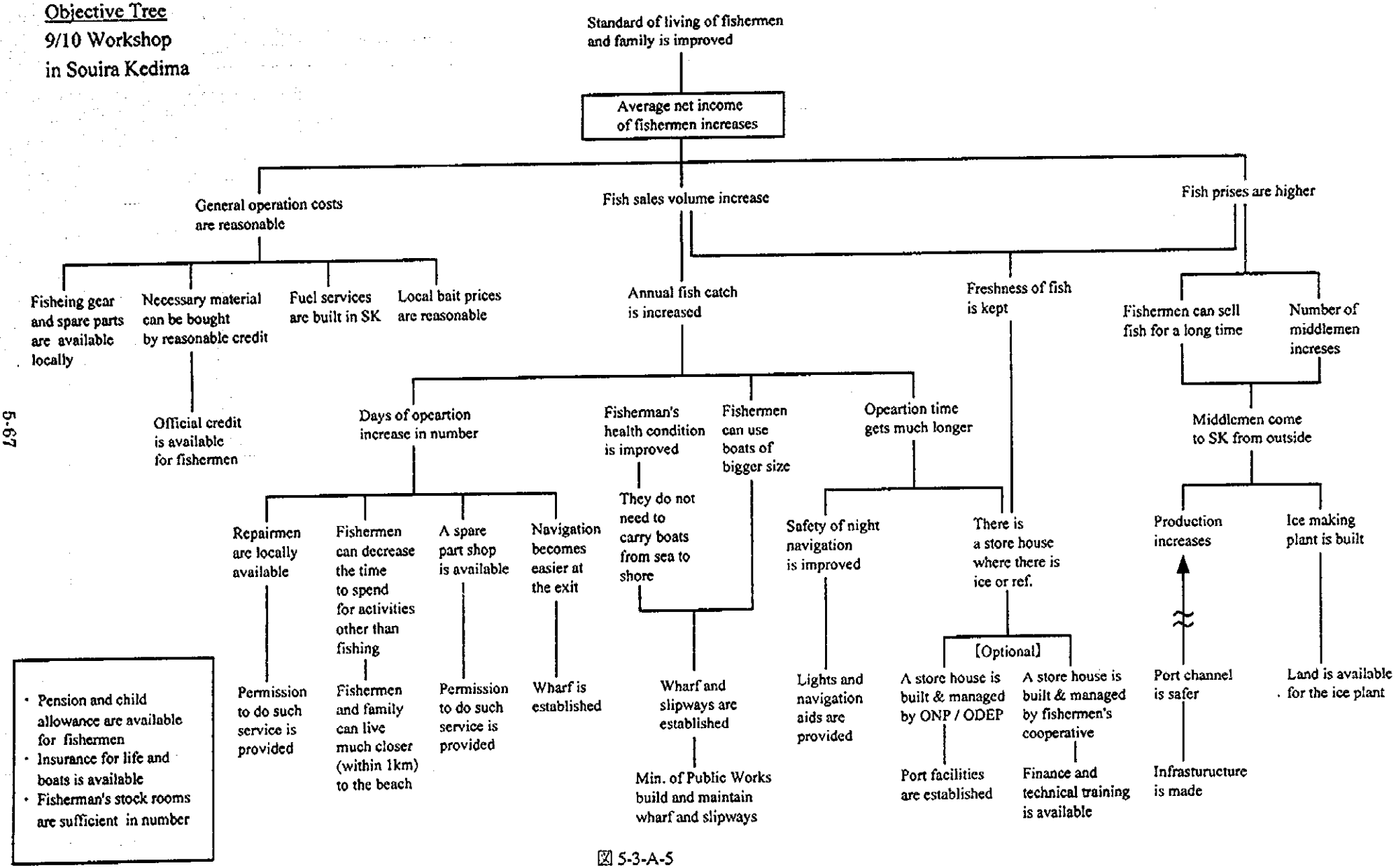
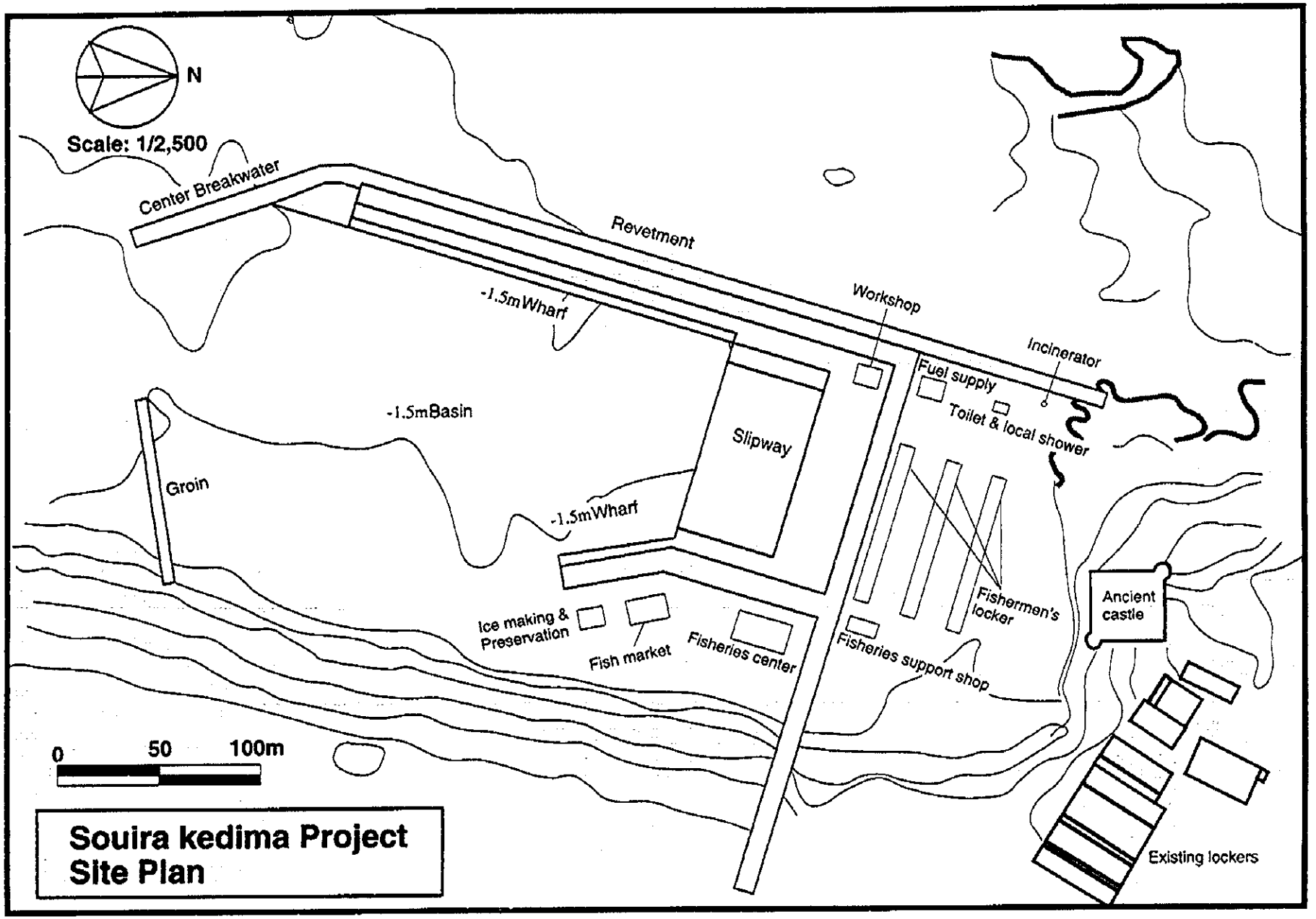
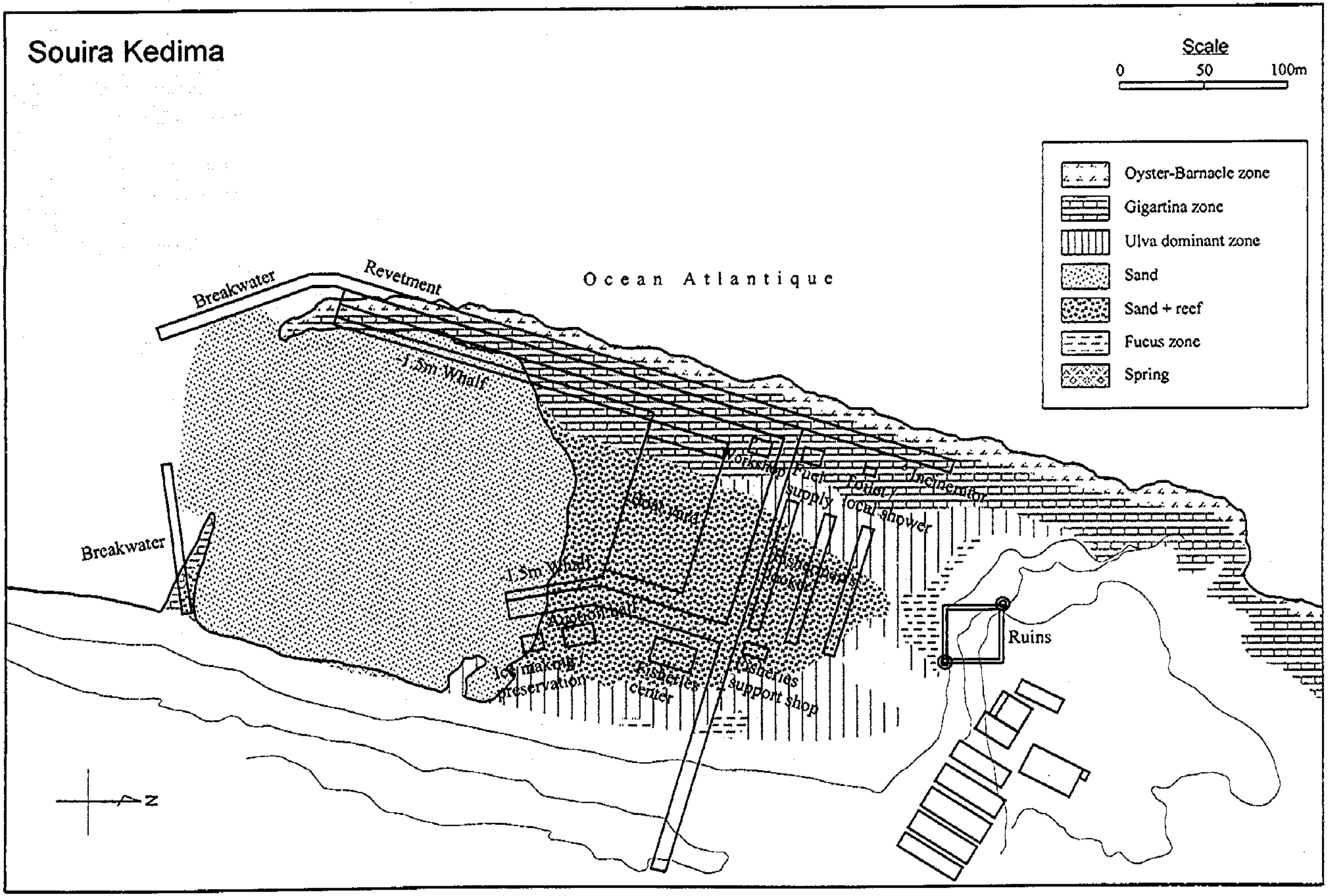


図 5-3-A-5


N
Scale: 1/2,500
Center Breakwater
Revetment
-1.5mWharf
Workshop
Incinerator
Fuel supply
Toilet & local shower
-1.5mBasin
Slipway
Groin
-1.5mWharf
Ice making & Preservation
Fish market
Fisheries center
Fisheries support shop
Fishermen's locker
Ancient castle
Existing lockers
0
50
100m
Souira kedima Project
Site Plan


Souira Kedima
Scale
0
50
100m
Oyster-Barnacle zone
Gigartina zone
Ulva dominant zone
Sand
Sand + reef
Fucus zone
Spring
Ocean Atlantique
Breakwater
Revetment
-1.5m Whalf
Breakwater
Workshop
Fuel supply
Toilet / local shower
Incinerator
Boat yard
Fisheries center
Fisheries support shop
Ruins
N

Project Design Matrix (PDM) on Suira Kedima 1/4

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal General standard of living of residents in the commune including Suira Kedima is increased.	(With the time frame of 10 years for example) 1. Significant increase of an average net income of fishermen per person (estimate) 2. Significant increase of average household income of residents (estimate)	1. and 2. Survey (random sampling)	1. There is no significant change in the governmental policies on artisanal fisheries. 2. Proper maintenance is undertaken for fisheries infrastructure. 3. Demand for fish does not decrease.
Development Targets 1. Fish sales prices are improved. 2. Fish sales volume is increased. 3. General operation cost of artisanal fisheries is reasonable. 4. Tourism industry is well developed. 5. Fishermen can work closer to houses.	(With the time frame of 5 years for example) 1. Net increase (inflation-adjusted) of fish sales prices broken down by fish species 2. Increase of fish sales volume broken down by fish species 3. Reasonable price level of fishing gear and other spare parts 4. Increase of number of tourists (annual base, estimate) Increase of tourism related sales 5. Shorter distance between the beach and home.	1. Sales record of public auction 2. Same as above 3. Survey on sales prices of goods at local stores 4. Official statistics or survey 5. Survey	Quality of basic public services (health related service for example) is maintained.

Project Design Matrix (PDM) 2/4

Outputs			
1. Number of middlemen working in Suira Kedima increases.	1. Increase of number of middlemen	1. Survey	1. Demand for fish does not decrease.
2. Annual fish catch is increased.	2. Increase of fish catch (broken down by fish species)	2. Sales record of public auction	2. People's need for tourism does not weaken.
3. Quality of fish is improved.	3. Improved fish handling process	3. Survey	
4. Fish resource management is introduced.	4. Revision of resource control regulations Satisfactory application of these regulations	4. Document Survey	
5. Local shops of repair and fishing gear are operational.	5. Increase of number of local repair and fishing gear shops	5. Survey	
6. Social preparation of fishermen's cooperative is undertaken.	6. Existence of group of fishermen's representatives and its conduct of activities	6. Activity record of the representatives' group	
7. Tourist related facilities are improved.	7. Increase of number of hotels, tourist residences, restaurants, tourist attraction and shops	7. Survey	
8. Housing for fishermen closer to the beach is developed.	8. Number of newly built residence for fishermen Number of fishermen/residents who move to new residence	8. Official statistics or survey	

Project Design Matrix (PDM) 3/4

Activities	Input	
1. Fisheries infrastructure 1) To establish and maintain wharf 2) To establish and maintain slip ways 3) To establish lights and navigation aids and to support navigation 4) To build proper auction facilities and to manage them 5) To establish other necessary port facilities and to maintain them 6) To build fish store house and manage it 2. Fish resource management 1) To conduct comprehensive resource surveys 2) To revise existing regulations 3) To put these regulations into practice 3. Fishing methods 1) To imrove fishing methods 2) To introduce fishing safety measures	Necessary financial input should be estimated here.	1. Coastal fisheries do not affect artisanal fishing. 2. There is no weather extreme which affects fishing activities. 3. Existing basic social infrastructure is properly maintained. Pre-conditions 1. Government and related public agencies are cooperative to the development plan. 2. There is no influential local individuals or organizations which are against the plan.

Project Design Matrix (PDM) 4/4

4. Fishing activities supporting service		
1) To give permission to conduct service		
2) To invite retailers and repairmen (To open shops by fishermen themselves)		
5. Fishermen's (Fisheries) cooperative		
1) To conduct introductory workshop about cooperative		
2) To set up a small group of representatives of fishermen		
6. Tourist related facilities		
1) To design area development plan		
2) To secure land/space for the tourist related facilities		
3) To build or improve these facilities and operate them		
7. Fishermen's housing development		
1) To design area development plan		
2) To secure land/space for the fishermen's housing		
3) To build housing and establish other necessary facilities/ infrastructure		
4) To make financial scheme for fishermen's purchase and to manage it		
8. Construction of a preliminary school to supplement the above fishermen's housing development		

Souira Kedima

Scope of facilities		Name of facilities	Scale of facilities	Note
Port facilities	Outer facilities	Center Breakwater	L= 100m	
		Groin	L= 90m	
		Revetment	L= 400m	
	Mooring facilities	Wharf(-1.5m)	L= 280m	
		Slipway(-1.5m)	W= 100m	
	Water facilities	Navigation aids	Navigation light : 2sets	
Port service facilities	Fish preservation facilities	Auction hall	Building area 560m2	Operated by ONP
		Ice making & preservation	Building area 150m2	
		Ice making plant	6ton/day、Ice storage 18ton	Flake ice
		Chilled room	5ton、50m2	Fish and bait
		Warehouse	Building area 30m2	Agar-agar
	Boat & gear maintenance	Workshop	Building area 150m2	Engine and hull
	facilities	Fishermen's locker	Building area 2,100m2	140 sets, stay style
	Supply facilities	Fuel supply	78kl fuel tank	Gasoline、Operated by private
	Fishermen's welfare	Fisheries support shop	Building area 150m2	10 booth
	facilities	Toilet and local shower	Building area 30m2	Use of incinerator heat
		Camping life utility	Building area 30m2	Cooking table、laundry
	Management facilities	Fisheries center	Building area 704m2	Including extension service
	Treatment facilities	Drainage treatment	Harbor area	Septic tank & subsurface
		Incinerator		infiltration
	Mulch purpose area	Dry area, parking, souk		
			Pavement	
Fishemens village social infra-structure	Road	Fishermen's village		
	Water supply	Branch water distribution		Service from ONEP
	Electricity supply	Main & branch line		Service from ONE
	Drainage and garbage	Drain gutter, sewer		Control by commune
	treatment			
	Fishermen's house	Fishemens housing site	Approx. 100 lots	Acquisition of land
	Public facilities	Community center		Increasing of population
		Elementary school		Increasing of population
Equipment	Fish handling equipment	Fish box, balance, cart etc.,		
	Multipurpose boat	survey training, rescue		
	Training equipment	fishing skill、navigation,		
	Health care equipment	Safety		
	Workshop tools	Resident		
	Mulch purpose car	Boat pull up, mobilization		

Table 5-3-A-17 Financial Analysis-Cost (i)

Financial Analysis
Capital Expenditure (CAPEX)

Area	Facility	Scale	Unit	Unit price (DH)	Price (DH)	Remarks
Port facilities					45,391,667	
	Center breakwater	100	m	125,000	12,500,000	
	Groin	90	m	41,667	3,750,000	
	Revetment	400	m	41,667	16,666,667	
	Wharf (-1.5m)	196	m	16,667	3,266,667	
	Slipway (-1.5m)	105	m	41,667	4,375,000	
	Navigation aids	2	set	125,000	250,000	
	Land	55,000	m3	83	4,583,333	
Port service					28,183,333	
facilities	Fish market	560	m2	5,833	3,266,667	
	Ice & preservation	150	m2	5,833	875,000	
	Fisheries center	700	m2	5,833	4,083,333	
	Workshop	150	m2	4,167	625,000	
	Fishermen's locker	2,100	m2	4,167	8,750,000	
	Warehouse	30	m2	4,167	125,000	
	Fisheries support shop	150	m2	5,833	875,000	
	Drainage treatment	1	set	833,333	833,333	
	Ice making plant	1	set	2,500,000	2,500,000	
	Chilled room	1	set	1,666,667	1,666,667	
	In-site road	1,000	m	3,333	3,333,333	
	External work	1	set	1,250,000	1,250,000	
Equipment					1,333,333	
	Fish handling	1	set	416,667	416,667	
	Lab. & training	1	set	416,667	416,667	
	Workshop	1	set	250,000	250,000	
	Multipurpose boat	1	set	250,000	250,000	
Consulting fee		1	set	5,992,667	5,992,667	
Total					80,901,000	

Table 5-3-A-17 Financial Analysis-Cost (ii)

Operation Expenditure: 821,153 DH/Year

Personnel Cost

Area	Title	Unit Price(DH)	No. of person	Cost (Month)
Administration	Manager	2,500	1	2,500
	Accountant	2,500	1	2,500
	Secretary	1,300	1	1,300
Ice machine	Engineer	2,700	1	2,700
	General worker	1,200	1	1,200
Workshop	Engineer	2,000	1	2,000
	Carpenter	1,400	1	1,400
Cantine	Cook	1,300	1	1,300
	Server	500	1	500
Clinic	Nurse	1,500	1	1,500
Hamam	Worker	1,200	1	1,200
Fuel Station	Worker	1,200	1	1,200
Research vessel	Captain	2,000	1	2,000
Others	Security men	1,200	2	2,400
Fish Market	Manager	2,500	1	2,500
	General worker	1,200	1	1,200
Total (month)				27,400
Total (year)				328,800

Cost of utility

Item	Use	Consumption	Unit price	Price (DH)	Remarks
Electricity	Ice machine	53	291	15,278	base charge (year)
		30,240	0.99	30,076	monthly use
	Refrigerator	432	1.27	549	monthly price
	Lights and others	864	1.30	1,123	monthly price
Total (year)				396,252	
Item	Use	Consumption	Unit price	Price (DH)	Remarks
Water	Fish market	150	5.83	875	monthly price
	Ice machine	270	5.83	1,574	monthly price
	Others	60	5.83	350	monthly price
Total (year)				33,581	

Maintenance and Operation Cost

facility	Cost (month)	Remarks
Workshop	500	
Clinic	500	medicines etc.
Hamam	1,710	fuel cost
Ice machine	500	
Building	500	
Other expenses	1,500	vehicles etc.
Total	5,210	
Cost (year)	62,520	

break down		
	daily consumpt'n	15
	unit price	3.8
	no. of days	30

Table 5-3-A-18 Financial Analysis-Benefit

Income (Benefit)

4,766,308 DH/Year		
in the First year	250,000	DH added

Fish landing commission

	Landing value(year)	Rate	Commission	Remarks
Fishery Coop.	63,814,464	1%	638,145	DH/year
ONP	63,814,464	5%	3,190,723	DH/year
Total			3,828,868	

Commission for fuel sales (L: litre)

No. of boats	Unit fuel use (L)	Unit charge/L	Commission	Remarks
27,930	40	0.2	223,440	DH/year

Ice sales

Daily production	Unit price (DH/ton)	No. of days	monthly sale	No. of month	Remarks
6	300	30	54,000	6	high season : May to October
		20	36,000	6	low season : November to April
Ice sales (year)				540,000	DH

Rental

Facility	Unit price (DH/pc.)	Amount	Total
fishermen locker	50	100	5,000
Workshop	3,000	1	3,000
Shops	50	10	500
G-total			8,500
Rental (year)			102,000

Other income

Facility	Income (month)	Amount	Total
Cantine	3,000	1	3,000
Hamam	3,000	1	3,000
G-total			6,000
Income (year)			72,000

Membership fee

Unit price (DH)	No. of member	Fee	Remarks
500	500	250,000	First year only

Table 5-3-A-19 Calculation sheet of FIRR

Financial Internal Rate of Return (FIRR)

Year	Cost	Benefit	Net Cash Flow	Discount Rate 2%	Net Present Value	Discount Rate 3%	Net Present Value
1	80,901,000	0	-80,901,000	0.980	-79,314,706	0.971	-78,544,660
2	821,153	5,016,308	4,195,155	0.961	4,032,252	0.943	3,954,336
3	821,153	4,766,308	3,945,155	0.942	3,717,607	0.915	3,610,375
4	821,153	4,766,308	3,945,155	0.924	3,644,713	0.888	3,505,219
5	821,153	4,766,308	3,945,155	0.906	3,573,248	0.863	3,403,125
6	821,153	4,766,308	3,945,155	0.888	3,503,184	0.837	3,304,005
7	821,153	4,766,308	3,945,155	0.871	3,434,494	0.813	3,207,772
8	821,153	4,766,308	3,945,155	0.853	3,367,151	0.789	3,114,341
9	821,153	4,766,308	3,945,155	0.837	3,301,129	0.766	3,023,632
10	821,153	4,766,308	3,945,155	0.820	3,236,401	0.744	2,935,566
11	821,153	4,766,308	3,945,155	0.804	3,172,942	0.722	2,850,064
12	821,153	4,766,308	3,945,155	0.788	3,110,727	0.701	2,767,052
13	821,153	4,766,308	3,945,155	0.773	3,049,733	0.681	2,686,458
14	821,153	4,766,308	3,945,155	0.758	2,989,934	0.661	2,608,212
15	821,153	4,766,308	3,945,155	0.743	2,931,308	0.642	2,532,245
16	821,153	4,766,308	3,945,155	0.728	2,873,831	0.623	2,458,490
17	821,153	4,766,308	3,945,155	0.714	2,817,482	0.605	2,386,883
18	821,153	4,766,308	3,945,155	0.700	2,762,237	0.587	2,317,363
19	821,153	4,766,308	3,945,155	0.686	2,708,075	0.570	2,249,867
20	821,153	4,766,308	3,945,155	0.673	2,654,976	0.554	2,184,336
21	821,153	4,766,308	3,945,155	0.660	2,602,918	0.538	2,120,715
22	821,153	4,766,308	3,945,155	0.647	2,551,880	0.522	2,058,947
23	821,153	4,766,308	3,945,155	0.634	2,501,843	0.507	1,998,977
24	821,153	4,766,308	3,945,155	0.622	2,452,787	0.492	1,940,755
25	821,153	4,766,308	3,945,155	0.610	2,404,694	0.478	1,884,228
26	821,153	4,766,308	3,945,155	0.598	2,357,543	0.464	1,829,347
27	821,153	4,766,308	3,945,155	0.586	2,311,316	0.450	1,776,065
28	821,153	4,766,308	3,945,155	0.574	2,265,996	0.437	1,724,335
29	821,153	4,766,308	3,945,155	0.563	2,221,565	0.424	1,674,112
30	821,153	4,766,308	3,945,155	0.552	2,178,005	0.412	1,625,351
					5,415,267		-4,812,488

FIRR	2.53 %

Table 5-3-A-21 Economic Analysis-Cost (i)

Economic Analysis
Capital Expenditure (CAPEX)

Area	Facility	Scale	Unit	Unit price (DH)	Market price	Convers'n factor	Shadow price
Port facilities					45,391,667		40,912,500
	Center breakwater	100	m	125,000	12,500,000	0.9	11,250,000
	Groin	90	m	41,667	3,750,000	0.9	3,375,000
	Revetment	400	m	41,667	16,666,667	0.9	15,000,000
	Wharf (-1.5m)	196	m	16,667	3,266,667	0.9	2,940,000
	Slipway (-1.5m)	105	m	41,667	4,375,000	0.9	3,937,500
	Navigation aids	2	set	125,000	250,000	1.14	285,000
	Land	55,000	m3	83	4,583,333	0.9	4,125,000
Port service					28,183,333		26,333,167
facilities	Fish market	560	m2	5,833	3,266,667	0.89	2,907,333
	Ice & preservation	150	m2	5,833	875,000	0.89	778,750
	Fisheries center	700	m2	5,833	4,083,333	0.89	3,634,167
	Workshop	150	m2	4,167	625,000	0.89	556,250
	Fishermen's locker	2,100	m2	4,167	8,750,000	0.89	7,787,500
	Warehouse	30	m2	4,167	125,000	0.89	111,250
	Fisheries support shop	150	m2	5,833	875,000	0.89	778,750
	Drainage treatment	1	set	833,333	833,333	1.14	950,000
	Ice making plant	1	set	2,500,000	2,500,000	1.14	2,850,000
	Chilled room	1	set	1,666,667	1,666,667	1.14	1,900,000
	In-site road	1,000	m	3,333	3,333,333	0.89	2,966,667
	External work	1	set	1,250,000	1,250,000	0.89	1,112,500
Equipment					1,333,333		1,485,000
	Fish handling	1	set	416,667	416,667	1.14	475,000
	Lab. & training	1	set	416,667	416,667	1.14	475,000
	Workshop	1	set	250,000	250,000	1.14	285,000
	Multipurpose boat	1	set	250,000	250,000	1.00	250,000
Consulting fee		1	set	5,992,667	5,992,667	1.00	5,992,667
Total					80,901,000		74,723,333

Table 5-3-A-21 Economic Analysis-Cost (ii)

Operation Expenditure: 742,229 DH/Year

Personnel Cost

Area	Title	Unit Price(DH)	No. of person	Cost (Month)	Convers'n factor	Shadow wage
Administration	Manager	2,500	1	2,500	1.0	2,500
	Accountant	2,500	1	2,500	1.0	2,500
	Secretary	1,300	1	1,300	1.0	1,300
Ice machine	Engineer	2,700	1	2,700	1.0	2,700
	General worker	1,200	1	1,200	0.5	600
Workshop	Engineer	2,000	1	2,000	1.0	2,000
	Carpenter	1,400	1	1,400	1.0	1,400
Cantine	Cook	1,300	1	1,300	1.0	1,300
	Server	500	1	500	0.5	250
Clinic	Nurse	1,500	1	1,500	1.0	1,500
Hamam	Worker	1,200	1	1,200	1.0	1,200
Fuel Station	Worker	1,200	1	1,200	0.5	600
Research vessel	Captain	2,000	1	2,000	1.0	2,000
Others	Security men	1,200	2	2,400	0.5	1,200
Fish Market	Manager	2,500	1	2,500	1.0	2,500
	General worker	1,200	1	1,200	0.5	600
Total (month)				27,400		24,150
Total (year)				328,800		289,800

Cost of utility

Item	Use	Consumption	Unit price	Price (DH)	Transfer item	Shadow price	Remarks
Electricity	Ice machine	53	291	15,278	1,069	14,208	base charge (year)
		30,240	0.99	30,076	2,105	27,971	monthly use
	Refrigerator	432	1.27	549	38	510	monthly price
	Lights and others	864	1.30	1,123	79	1,045	monthly price
Total (year)				396,252		368,515	
Item	Use	Consumption	Unit price	Price (DH)	Transfer item	Shadow price	Remarks
Water	Fish market	150	5.83	875	61	813	monthly price
	Ice machine	270	5.83	1,574	110	1,464	monthly price
	Others	60	5.83	350	24	325	monthly price
Total (year)				33,581		31,230	

Maintenance and Operation Cost

facility	Cost (month)	Remarks	Transfer item	Shadow price
Workshop	500		100	400
Clinic	500	medicines etc.	100	400
Hamam	1,710	fuel cost	120	1,590
Ice machine	500		100	400
Building	500		100	400
Other expenses	1,500	vehicles etc.	300	1,200
Total	5,210			4,390
Cost (year)	62,520			52,684

break down		
	daily consumpt'n	15
	unit price	3.8
	no. of days	30

Transfer item means the VAT (Value Added Tax). Their tax rate are

fuel, light	7 %
other commodities	20 %

Table 5-3-A-22 Economic Analysis-Benefit

Benefit: 10,239,315 DH/Year

	without Project		with Project		Surplus production	Surplus value	Consumer's surplus Shadow price
	Landed quantity	Landing value	Landed quantity	Landing value			
Total Landing	2,197,675	56,260,480	2,374,050	63,814,464	176,375	7,553,984	
To export						3,776,992	5,166,925
To domestic						3,776,992	4,532,390

Increase of landing	Increase of export	Increase of domestic supply
9,699,315	5,166,925	4,532,390

Rate of increase of landed quantity	8.0	%
Rate of increase of fish price	5	%
Percentage of export oriented	50	%
Percentage of domestic oriented	50	%
Domestic marketing factor	1.20	
Shadow exchange rate	1.14	

Note 1:
With the construction of fish market, more competitive price will be realized through the auction among meddle men.
With the construction of refrigerator, quality down caused by the absence of refrigerator, will be controlled.
As a result, fish price is expected to increase as left
(based on the interview survey at site)

Note 2:
Product is exported from Port of Casablanca
Product is consumed at the market of Casablanca

Ice sales

Daily production	Unit price (DH/ton)	No. of days	monthly sale	No. of month	Remarks
6	300	30	54,000	6	high season : May to October
		20	36,000	6	low season : November to April
Ice sales (year)				540,000	DH

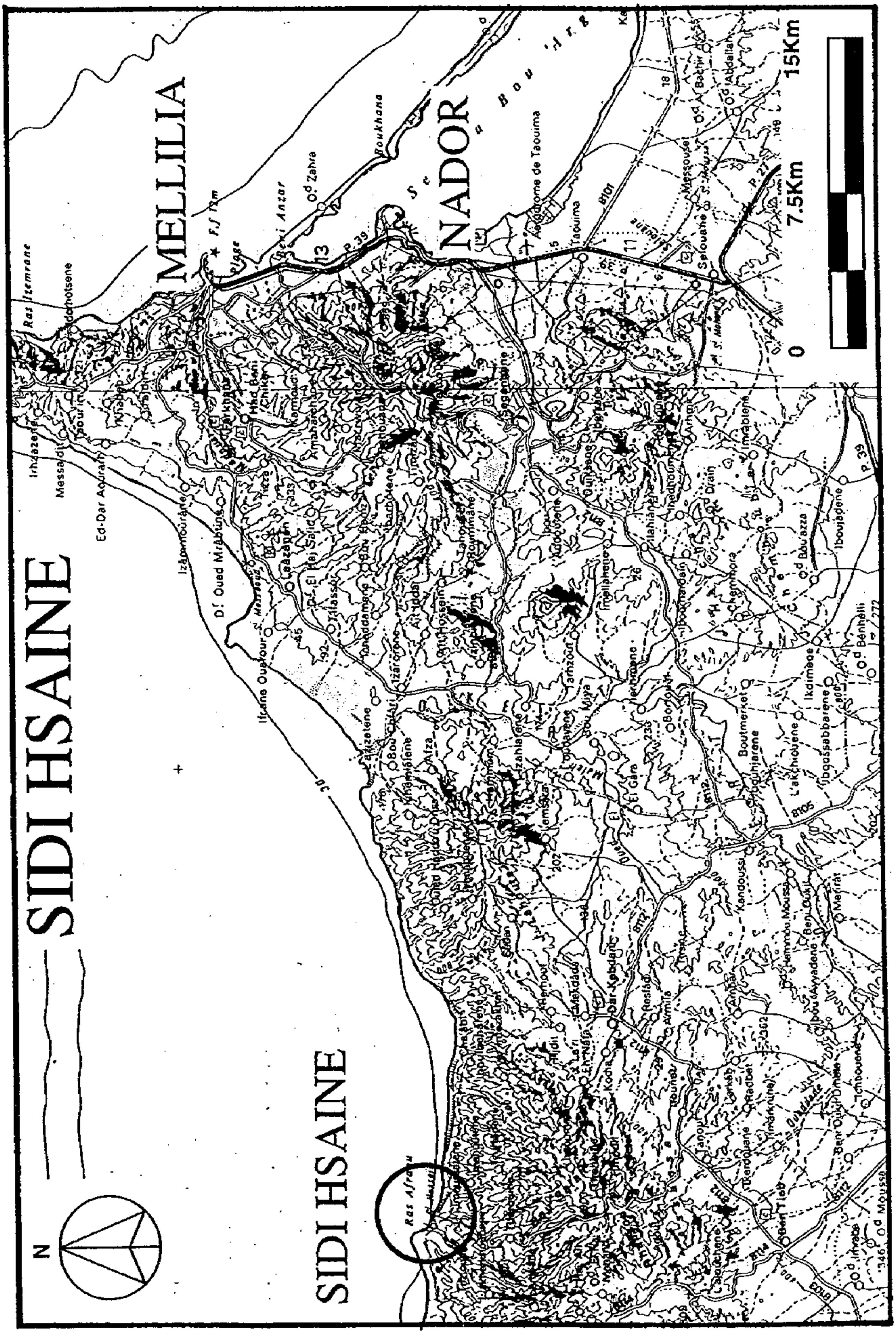
Table 5-3-A-23 Calculation sheet of EIRR

Economic Internal Rate of Return

Year	Cost	Benefit	Net Cash Flow	Discount Rate 12%	Net Present Value	Discount Rate 13%	Net Present Value
1	74,723,333	0	-74,723,333	0.893	-66,717,262	0.885	-66,126,844
2	742,229	10,239,315	9,497,087	0.797	7,571,020	0.783	7,437,612
3	742,229	10,239,315	9,497,087	0.712	6,759,839	0.693	6,581,958
4	742,229	10,239,315	9,497,087	0.636	6,035,570	0.613	5,824,741
5	742,229	10,239,315	9,497,087	0.567	5,388,902	0.543	5,154,638
6	742,229	10,239,315	9,497,087	0.507	4,811,520	0.480	4,561,627
7	742,229	10,239,315	9,497,087	0.452	4,296,000	0.425	4,036,838
8	742,229	10,239,315	9,497,087	0.404	3,835,714	0.376	3,572,423
9	742,229	10,239,315	9,497,087	0.361	3,424,745	0.333	3,161,436
10	742,229	10,239,315	9,497,087	0.322	3,057,808	0.295	2,797,731
11	742,229	10,239,315	9,497,087	0.287	2,730,186	0.261	2,475,868
12	742,229	10,239,315	9,497,087	0.257	2,437,666	0.231	2,191,034
13	742,229	10,239,315	9,497,087	0.229	2,176,487	0.204	1,938,968
14	742,229	10,239,315	9,497,087	0.205	1,943,292	0.181	1,715,901
15	742,229	10,239,315	9,497,087	0.183	1,735,082	0.160	1,518,496
16	742,229	10,239,315	9,497,087	0.163	1,549,181	0.141	1,343,802
17	742,229	10,239,315	9,497,087	0.146	1,383,197	0.125	1,189,205
18	742,229	10,239,315	9,497,087	0.130	1,234,997	0.111	1,052,394
19	742,229	10,239,315	9,497,087	0.116	1,102,676	0.098	931,322
20	742,229	10,239,315	9,497,087	0.104	984,532	0.087	824,179
21	742,229	10,239,315	9,497,087	0.093	879,047	0.077	729,362
22	742,229	10,239,315	9,497,087	0.083	784,863	0.068	645,453
23	742,229	10,239,315	9,497,087	0.074	700,771	0.060	571,197
24	742,229	10,239,315	9,497,087	0.066	625,688	0.053	505,484
25	742,229	10,239,315	9,497,087	0.059	558,650	0.047	447,331
26	742,229	10,239,315	9,497,087	0.053	498,795	0.042	395,868
27	742,229	10,239,315	9,497,087	0.047	445,352	0.037	350,326
28	742,229	10,239,315	9,497,087	0.042	397,636	0.033	310,023
29	742,229	10,239,315	9,497,087	0.037	355,032	0.029	274,357
30	742,229	10,239,315	9,497,087	0.033	316,993	0.026	242,794
					1,303,978		-3,344,473

EIRR	12.28 %

Sidi Hsaine


SIDI HSAINE
SIDI HSAINE
MELLILIA
NADOR
N
0
7.5Km
15Km
Ras Afrou

B. Sidi Hsaine

1. General conditions of the site

Sidi Hsaine is a gravel beach on the Mediterranean Sea, formed at the edge of an alluvial fan which is sandwiched between steep cliffs. The presumed population of the artisanal fishermen basing in Sidi Hsaine is less than 300, and that of their families is about 1,500[1]. Most of these artisanal fishermen live in the commune rurale including Sidi Hsaine, but some of them come from other adjacent commune rurales. The number of the residents in the whole commune rurale is over 6,000[2]. Different from the other investigation sites, the ratio of fishermen to the whole residents is remarkably low. Accordingly, they earn large part of their incomes from livestock raring. Fishermen mainly catch sardine and anchovy by small seiners, while they also catch grouper, sea bream, and flatfish with gill net, trammel net and bottom longline by small boat all the year around. The level of fishing technique in this site is higher than those in other fishing villages on the Atlantic Ocean. The selling prices are also high because consumer city is adjacent to the village. Accordingly, the income per fisherman is expected to be a little higher than Suira Kedima, in which the average income per fisherman seems to be the highest among all the fishing villages on the Atlantic Ocean.

1) Fisheries

(1) Overview

Facing onto the Mediterranean Sea, Sidi Hseine is a landing beach adjoining Point Afrou, which is the central point of a large bay enclosed on both sides by Ras Tart Peninsula and Trois Rourches Peninsula. This bay possesses abundant reserves of fish, mainly sardine, and wide-ranging fishing grounds are formed by an undersea mountain range that runs along the coastline. Fisheries activities can broadly be divided into fisheries conducted by small purse seine fishing boat units and fisheries conducted by small fishing boats. The former requires capital while the latter is the traditional form of fishing in the area. The main fishing grounds are located less than two hours from the beach, but fishermen cover a wide area from the eastern tip to the western tip of the bay and the grounds are shared with artisanal fishermen from Kalet and Sidi doris, etc. as well as coastal purse seine fishing boats based in Nador and Al Hoceima.

(2) Number of Fishing Boats

There are 47 officially registered fishing boats. Three purse seine fishing boat units were observed in the survey conducted in December and, in the field surveys carried out in February, October and November, eight small purse seine fishing boat units (one of which was broken and not operating) and some 70 small boats were confirmed. These numbers include fishing boats which are laid-up on adjoining beaches but land their catches in Sidi Hsaine. At peak times, it is thought that eight small purse seine fishing boat units and 70 small fishing boats use this landing beach. However, in the winter when sea conditions become rough, some boats transfer to the ports of Nador and Al Hoceima. Moreover, since four purse seine fishing boats owned by local fishermen and registered for coastal fishing sometimes operate in nearby waters and land their catches here in the summer season, this also needs to be taken into account.

The small purse seine fishing boats based at Sidi Hsaine are the most advanced artisanal fishing boats to be found in Morocco. Although small with a total length of just 6 m, these boats are powered by 40-70 HP inboard motors and possess decks that make it easy to carry out onboard work. The boats are equipped with fish finder, marine radio as well as capstan that merchandises the net hauling process. Although made of wood, these boats can be said to make the ultimate form of artisanal fishing possible. The small purse seine fishing boats can easily be used to conduct other forms of fishing such as drift gillnet

[1] These figures are calculated based on the site researches.

[2] From " Population Legale du Maroc, 1994, Direction de la Statistique, Maroc ".

fishing and long line fishing depending on the season and they enable highly advanced fisheries activities to be carried out. In contrast, traditional fishing methods using small boats have failed to make any significant progress and the disparity between these activities and the activities of the purse seine fishing boats is great in terms of both equipment and income.

(3) Annual Operating Days and Operating Pattern

Operating Pattern in Sidi Hsaine

The number of operating days differs between small purse seine fishing boats and artisanal fishing boats. The operating rate of fishing boats, judging from results of the interview surveys and observation, is estimated to be 80% in summer and 50% in winter.

Table 5-3-B-1 Number of Operating Days of Small Purse Seine Fishing Boats

January	February	March	April	May	June	July	August	September	October	November	December
7 days	7 days	17 days	18 days	21 days	24 days	24 days	24 days	18 days	17 days	16 days	8 days

Total 201 days

Table 5-3-B-2 Number of Operating Days of Artisinal Fishing Boats

January	February	March	April	May	June	July	August	September	October	November	December
10 days	10 days	18 days	18 days	22 days	25 days	25 days	25 days	20 days	19 days	18 days	10 days

Total 221 days

The number of fishing boats that go out fishing is considered to be as follows, with consideration given to characteristic manner in which purse seine fishing boats operate.

January-February	8 small purse seine fishing boat units x 50% =4 units
	70 artisinal fishing boats x 50% =35 boats
March	8 small purse seine fishing boat units x 80% =6 units
	70 artisinal fishing boats x 80% =56 boats
April-June	2 small purse seine fishing boat units x 80% = 2 units
	4 large mesh drift net fishing boats x 80% =3 boats
	2 long line fishing boats x 80% =2 boats
	70 artisinal fishing boats x 80% =56 boats
July-August	8 small purse seine fishing boat units x 80% =6 units
	70 artisinal fishing boats x 80% =56 boats
September-December	8 small purse seine fishing boat units x 50% =4 units
	70 artisinal fishing boats x 50% = 35 boats

When the above data are put together, the following operating schedule is imagined.

Table 5-3-B-1 Small Purse Seine Fishing Boats in Sidi Hseane: Annual Operating Schedule, Possible Operating Days per Month and Number of Operating Boats

Fishing Method/Month	1	2	3	4	5	6	7	8	9	10	11	12
Small Purse Seine	■	■	■	■	■	■	■	■	■	■	■	■
Drift Net, Long Line				■	■	■						
Monthly Operating Days	7	7	17	18	21	24	24	24	18	17	16	8
Monthly Operating Boats	4	4	6	7	7	7	6	6	4	4	4	4

The combined annual number of operating small purse seine fishing boats (total catch effort) is 1,123 boat-days.

Table 5-3-B-2 Artisanal Fishing Boats in Sidi Hseine: Annual Operating Schedule, Possible Operating Days per Month and Number of Operating Boats

Fishing Method/Month	1	2	3	4	5	6	7	8	9	10	11	12
Trammel Net, Hand Line	■	■	■	■	■	■	■	■	■	■	■	■
Gillnet, Bottom Long Line, etc.	■	■	■	■	■	■	■	■	■	■	■	■
Monthly Operating Days	10	10	18	19	22	25	25	25	20	19	18	10
Monthly Operating Boats	35	35	56	56	56	56	56	56	35	35	35	35

The combined annual number of operating artisinal fishing boats (total catch effort) is 10,549 boat-days.

(4) Forms of Operation by Fishing Ground and Fishing Method

Fishermen based in Sidi Hseine employ a wide variety of fishing methods, namely purse seine fishing, tuna long line fishing, drift net fishing, bottom gillnet fishing, surface gillnet fishing, trammel net fishing, octopus pot fishing and hand line fishing. The fishing grounds of small purse seine fishing boats cover a wide area beyond the bay from Al Hoceima in the west to Trois in the east. Artisanal fishing boats often work fishing grounds in waters of up to 60 m in depth within the bay from Ras Tart to around Charna or Ras Baraket.

Close to the coastline, the seabed is sandy and up to 45 m deep, beyond that there is a shore reef belt (undersea mountain range) that runs along the coast at a depth of 45-50 m, and beyond that the seabed becomes sandy again. The distance from the coast to the shore reef belt is estimated as close to 10 km. Landed quantities and daily operating hours by fishing method are shown in a separately attached table (Results of Survey in October).

Purse seine fishing boat units leave for sea late at night between 12.00 and 2.00 a.m. with accompanying lightships and skiffs and return to the beach early next morning between 5.00 and 7.00 a.m. The nets used are 400 m in length and 20-40 m in height and are cast after the size and depth of fish shoals have been confirmed by fish finder. Fishing grounds range in depth from 22 m to 105 m, however, depending on the relationship with purse seine height, fishing is carried out in grounds where the seabed is sandy when fish are at the depth of less than 60 m or where the seabed is rocky in cases where fish are at the depth of more than 60 m. The fishing usually finishes with one cast of the net. In the surveys, catches were found to range from 25 to 60 fish boxes (750-1,800 kg), but there are occasions when catches as big as 80 boxes (2,400 kg) are landed. The main types of caught fish are anchovy and sardine, but horse mackerel are also caught.

From April through June, the purse seine fishing boats conduct tuna long line and drift net fishing as a seasonal concern. Covering wide-ranging fishing grounds, these boats catch skip jack, swordfish, shark, sea bream (*Diplodus spp.*) and sea bream (*Pagellus spp.*).

Fishing trips using trammel net were found in the October survey to be extremely short with boats leaving for sea in the early morning between 6.00 and 7.00 a.m. and returning to the beach before 9.00 a.m., and the fishing grounds are located close to shore. Nets are left in fishing grounds of rocky seabed at a depth of around 45 m. The survey found catches of sea bream (*Diplodus spp.*), gurnard and skip jack to be small

(approximately 12 kg), but depending on the season catches of groupers, red mullet and cuttlefish reach as much as 30-50 kg.
Bottom long line fishing is usually carried out in fishing grounds of rocky seabed at a shallow depth less than 60 m. At the time of the October survey, few fishing boats were conducting this activity and the landing of some sea bream (*Sparus spp.*) and sea bream (*Diplodus spp.*) is all that was observed. Having said that, the main types of fish caught in this way are groupers and sea bream (*Pagellus spp.*).
Other fishing methods are lobster trapping and hand line fishing through which sama, red pandora (*Pagellus sp.*), sea bream (*Pagellus spp.*) and groupers are caught.

(5) Quantity and Value of Landed Fish

Table 5 indicates data collected in the October survey showing the average quantity and value of fish landed per fishing trip according to each fishing method. The unit prices of each fish type are shown in Table 6.

Table 5-3-B-3 Average Quantity and Value of Fish by Fishing Method

Fishing Method (Sample Number)	Small Purse Seine		Artisinal Fishing Boats Mixed	
	Weight (box)	Value (DH)	Weight (box)	Value (DH)
October interview survey	47.6	9,227.4	33.6	728.1
Sample number	18		6	
October observation survey	42.8	8,026	14.3	370.7
Sample number	5		9	
Weighted average	46.6	8,966.2	22.0	513.7

Table 5-3-B-4 Unit Prices of Major Fish Landed at Sidi Hsaine

Fish Type	Most Common Price (DH/kg)	Price Range (DH/kg)
Anchovy	400/box	300-500/box
Skip jack	15	15
Sea bream (*Sparus spp.*)	30	30
Swordfish		50-120
Groupers	50	50-70
Sea bream (*Pagellus spp.*)	25	25-70
Octopus		45-50
Rockfish	30	30
Gurnard	20	20-40
Sea bream (*Diplodus spp.*)	20	15-30
Sardine	200/box	150-200/box
Seiche	25	25

Note) Anchovy and sardine are always sold by box, each box containing approximately 30 kg of fish.

Here, from data obtained in the October survey, the daily quantity and value of fish landed by one purse seine fishing boat unit are given as 1,400 kg and 9,000 DH respectively, and assuming the quantity and value of landed fish caught by tuna long line and large mesh drift net fishing as 300 kg and 9,000 DH

respectively. Below is given an estimate of the annual landed quantity and value calculated from the total number of operating fishing boats obtained from the monthly number of possible operating days and number of fishing boats. The average quantity and value of fish landed by one artisinal fishing boat per day are given as 22 kg and 500 DH respectively.

Annual landed quantity = 1,300 kg ◊ 1,123 - 5 ◊ (18 + 21 + 24) ◊ (1,400 - 300) + 22kg ◊ 10,549
= 1,345,778 kg = approx. 1,346 tons
Annual landed value = 9,000 DH ◊ 1,123 + 500 DH ◊ 10,549 = 15,525,500 DH

(6) Fisheries Balance

Table 7 gives a trial calculation of the annual income of one unit of small purse seine fishing boats based on the assumption that the unit conducts fishing on 75% of the annual number of possible operating days (201 days). The annual income per fisherman, calculated by simply dividing the profit following deduction of expenses by the number of fishermen (14), works out to be roughly 82,000 DH (US $ 8,800) (US $ 1 = 9.25 DH). Assuming the average size of a fisherman's family to be seven members, the cash income per family member comes to around US $ 1,260. This is about 30% more than the income of artisinal fishermen based on the Atlantic Ocean coast. The initial capital investment of 500,000 DH (US $ 54,000) is relatively large, however, it works out that this can easily be offset by just over 30% of the net profit made in one year.

Table 5-3-B-5 Trial Calculation of the Balance of Small Seine Fishing Boats in Sidi Hseine (Unit : DH)

Revenue /Day	Revenue /Year	Annual Fuel and Bait Cost	Annual Fishing Gear Maintenance Cost	Fishing Gear Depreciation	Hull and Engine Maintenance Cost	Hull and Engine Depreciation	Profit	Profit per Fisherman
9,000	1,350,000	135,000	10,000	20,000	20,000	20,000	1,145,000	81,786

Note) In reality, the share of profits received by the ship owner and captain differs from that of the crew, and this ratio differs again depending on the fishing method.

Trial calculation criteria:

Concerning fuel cost, for net fishing boats, a daily operating time of three hours, fuel consumption of 60 liters and fuel price of 6 DH per liter are assumed. For lightships and skiffs, a daily operating time of three hours, fuel consumption of 30 liters and fuel price of 9 DH per liter are assumed. Purse seine nets are assumed to cost 100,000 DH, incur an annual repair cost of 10,000 DH and have a depreciation period of five years. A unit of three boats is assumed to cost 400,000 DH, incur an annual hull and engine maintenance cost of 20,000 DH and have a depreciation period of 20 years. The number of crew members per boat is assumed to be 14.

2) Fisheries Infrastructure

The project site is located almost in the center of the coastline that links Nador to Al Hoceima at a point where a sand beach created by a river alluvial fan joins with the eastern sloping face of a rock line that protrudes from the coastline. The fishermen's community is scattered on the north slope of the Rif Mountain Range over from the alluvial fan. The landing beach, located on the edge of the alluvial fan, contains 10 large fishermen's lockers capable of storing fishing boats, a canteen, cafe and general store. Fishermen do not stay overnight in the lockers but walk back to their homes after completing fishing trips. Fishermen who do not own lockers sometimes haul their fishing boats back to their homes to keep safe in

the off season.

Access to the project site is provided by a minor road that branches off from the main road which cuts through Rif Mountain Range and links Nador to Al Hoceima. Traffic to the site is busy on the route that passes through Tizirhine and runs along the coast. Another possible route crosses over the mountains via Dar Kebdani, however, since this is dangerous because of the narrow width of the road and absence of paving, only a few vehicles going to Nador use it. Because the road that links the project site to Tizirhine (7 km) is narrow and has steep slopes and sharp bends, it is difficult for large vehicles to use. All roads in the area are managed by the communes.

With respect to water supply, inhabitants living inland use river water obtained from a number of shallow wells excavated in the river basin. Water is mainly pumped by children and carried back home using donkeys or other livestock. In the nearest town of Tizirhine, a water supply system has been constructed by the communes.

Concerning electricity, the public distribution network supplies power as far as Tizirhine, however, the project site is not covered by this. Moreover, since Sidi Hsaine is not included in the PERG that was formulated in 1996, there is no likelihood of the area receiving electricity supply in the near future. It is said that the cost of installing power lines from Tizirhine to the project site would amount to approximately 1-5 million DH.

The only public facility in Sidi Hsaine is a primary school located on the south side of the alluvial fan, so local inhabitants need to travel to Tizirhine for fuel, medical care and other services.

3) Fishing Village Society

Fishermen's Households and Housing

(1) Composition of Fishermen's Households

The average number of family members per household is 14.1, which is more than two times more than average household sizes in the other project areas. Each household consists of 7.4 male family members and 6.7 female family members on average. This is due to the fact that it is extremely common for sons to remain in their parents' homes after getting married and it is the norm for multiple nuclear families to live under the same roof.

Table 5-3-B-6 Average Household Composition

Sidi Hseine	Male	Female	Total
	7.4	6.7	14.1

(2) Form of Housing

Since expanded families live under the same roof as described above, the area and number of rooms per house are 316.5 m^2 and 7.8 rooms respectively, more than twice the size of corresponding figures in other areas.

Table 5-3-B-7 Form of Housing

	House Building Style (Number of Houses)		Distance from House to Beach (km)	Number of Rooms	House Ownership (Number of People)		House Area (m^2)	Water Supply	
Sidi Hsaine	Ordinary building	24	1.27	7.8	Own home	14	318.5	Well, etc.	21
	Clay building	0			Rented	0			
	Barrack	0			Free	2			
					Parent's home	8			

The home owner is usually the head of the household, but there are also numerous cases where the head of the household lives in his parents' home. This is consistent with the fact that house sizes here are large as compared to other areas. The average distance from houses to the beach is 1.27 km, which is the shortest distance to be found among all the target fishing villages.

(3) Fuel

Firewood is used by at least 80% of households. This is never purchased but gathered by adult women and children from common land or nearby forest. Firewood, however, is hardly ever used for heating purposes - this role is mainly served by butane gas.

Table 5-3-B-8 Energy Use

	Electrification	Butane Gas Use			Firewood Purchase in Winter	
	Yes/No	Yes/No	Small Bottle	Large Bottle	Weight (kg)	Purchasing Households
Sidi Hsaine	Yes 4	Using households	23	24	200	All 0
	No 20	Average number of users				
		Number of bottles	59.48	123.00		Half 0
		Total household average Number of bottles	57.00			Few 0
						None at all 22
	Firewood Use					
	Yes/No	Purpose of Use (Households)	Source (Households)	Firewood Gatherers	Gathering Site	
	21	Cooking 19	Cutting 0	Adult males 0	Private land 0	
	3	Bread making 21	Gathering 22	Adult females 22	Common land 20	
		Heating 1	Purchase 0	Children 11	Forest 11	
					Protected district 2	

Role of Agriculture for Fisherman Households

(1) Ownership and Benefit of Cultivated Land

The average cultivated area per household is 0.85 ha, which is more or less the same as in other target fishing villages. However, as was described earlier, because the size of households in Sidi Hsaine is two times greater than in the other target villages, the fact that the cultivated land area per household is the same means that fishermen here must place greater reliance on fisheries to secure income.

Table 5-3-B-9 Cultivated Land Use

		Cultivated Land (ha)	Fallow Land (ha)	Pasture (ha)	Devastated Land (ha)	Total (ha)	Furthest Away Field (Owner Only) (km)
Sidi Hsaine	Overall average	0.85	0.00	0.00	0.00	0.85	
	Owner average	4.10	0.00	0.00	0.00		1.75

(2) Field Cultivation and Livestock Rearing

① Cereals, Vegetables and Fruit

Looking at the number of cultivated farm products and purchased farm products, of 19 varieties which were made the subject of investigation, the number of purchased farm product varieties was greater than the number of cultivated varieties, the former being 15 and the latter nine. The reason for this is thought to be that soil in the area is not fertile and is unable to support crops.

Table 5-3-B10 Cultivated Farm Products and Purchased Farm Products

		Cereals				Beans			Vegetables			
Sidi Hsaine		Barley	Wheat	Corn	Other Cereals	Chick Beans	Lentils	Other Beans	Green Vegetables	Tomatoes	Potatoes	Other Vegetables
	Cultivating households	5	3	4	4	2	1	0	0	0	1	1
	Purchasing household	1	2	0	0	2	3	4	4	4	3	3
		Fruit										
		Olives	Almonds	Apples	Oranges	Argand	Figs	Pomegranates	Other Fruit			Total Farm Products
	Cultivating households	1	0	0	0	0	0	0	0			9
	Purchasing household	3	4	4	4	4	0	0	4			15

Livestock Raising

All households keep a donkey used for carrying things, but the only other kept animals are chickens, etc.

Fishermen's Livelihoods

(1) Income from Fisheries and Agriculture in Fisherman Households

Practically 100% of cash income is obtained from fisheries.

Table 5-3-B-11 Breakdown of Household Income

	April through October			November through March		
	Income from Agriculture	Income from Fishery	Income from Sale and Others	Income from Agriculture	Income from Fishery	Income from Sale and Others
Sidi Hsaine	0.46%	99.54%	0	0.46%	99.54%	0

(2) Crew per Fishing Boat and Distribution of Profits

Table 5-3-B-12 Distribution of Profits

Sidi Hseine	Number of Persons Involved per Boat					Distribution of Catches						
	Boat Owner	Fishing Master	Crew Member	Personnel for Boat Transfer	Cleaning Personnel	Boat Expenses	Boat Owner	Fishing Master	Crew Member	Personnel for Boat Transfer	Cleaning Personnel	Others
Bottom long line fishery	0	1	2	0	0	20%	0%	40%	40%	0%	0%	0%
Angling fishery Net fishery	0	1	2	0	0	15%	0%	43%	43%	0%	0%	0%
Artisinal fishing boats	0	1	2	0	0	16%	0%	42%	42%	0%	0%	0%
Sardine fishing boats	0	1	11	0	0	10%	0%	45%	45%	0%	0%	0%
Separate boat owner and captain	1	1	10	0	0	10%	45%	8%	38%	0%	0%	0%

(Bottom Long line Fishing)

The operating crew consists of just three members - one chief fisherman and two crew - and nobody is specially employed to clean the boat. The boat owner also acts as the chief fisherman, as is also the case

on the other target beaches. As for the distribution of profits, after 20% is deducted for boat expenses, the remainder is divided equally between the boat owner/chief fisherman and the other crew members. Since there are only two other crew members, each receives 20% of the profits. This is a slightly higher share than that received by crew members based on the Atlantic Ocean side.

(Hand Line Fishing)
Data could only be collected with respect to the boat owner who also acts as the chief fisherman. As for the distribution of profits, after 20% is deducted for boat expenses, the remainder is divided equally between the boat owner/chief fisherman and the other crew members. In other words, the share taken by the boat owner/chief fisherman is twice that of each crew member.

(Net Fishing)
Artisanal fishing boats use nets to catch demersal fish, whereas sardine fishing boats carry out purse seine fishing. On this beach, three types of net fishing boat were observed: artisanal fishing boats where the owner also acts as chief fisherman, sardine fishing boats where the owner also acts as chief fisherman, and sardine fishing boats where the owner and chief fisherman are separate. When one considers this last case together with the other fishing methods adopted in Sidi Hseane, the basic method of profit distribution is to divide it equally between the boat owner and the crew members (including the chief fisherman). Consequently, the profit made by a single sardine fishing boat is large and the income made by the boat owner, who receives a 45% cut of the profit, is extremely high. However, since the remainder is equally shared out among 11 crew members including the chief fisherman, income for the crew is not so high at all.

(3) Sources of Fish for Private Consumption by Fishermen and Frequency of Fish Eating
In summer the fishermen are able to obtain all the fish they need for private consumption from their own catches, but in winter catches only provide 60% and 79% of the fish required by boat owners and crew members respectively. Boat owners pay a higher price than crew members to purchase fresh fish in the winter, but this is because sardine fishing boat owners buy demersal fish from artisanal fishing boats. Inhabitants of Sidi Hseane have a very strong liking for fish compared to in the other target fishing villages, and high income earners such as sardine fishing boat owners purchase the kind of demersal fish that can be shipped to Nador. Moreover, the fact that the frequency of fish eating hardly changes between the summer and winter seasons is another indication of how much people in this area prefer fish. Moreover, the fact that although the ratio of fish purchased by crew members in winter is not as high as that of boat owners, etc., they eat fish the same number of times in winter as in summer is thought to be a reflection of the fact that catches do not decrease that much in the winter months.

Table 5-3-B-13 Sources of Fish for Private Consumption

		April through October			November through March		
		Fishes from Own Catch	Purchased Fresh Fishes	Canned Fishes	Fishes from Own Catch	Purchased Fresh Fishes	Canned Fishes
Sidi Hsaine	Boat owner	100%	0%	0%	60%	40%	0%
	Crew members	100%	0%	0%	79%	21%	0%

Table 5-3-B-14 Frequency of Fish Eating

		April through October					November through March				
		Every Day	4 - 6 Days	2 - 3 Days	1 Day	None	Every Day	4 - 6 Days	2 - 3 Days	1 Day	None
Sidi Hseane	Boat owner	0%	90%	10%	0%	0%	0%	90%	10%	0%	0%
	Crew members	0%	93%	7%	0%	0%	0%	86%	14%	0%	0%

Migration and Settlement of Fishermen

(1) Work at the Start of a Career in Fisheries

Fishermen begin their fisheries careers from the relatively early average age of 16, and 40% of new fisheries workers start off doing support work.

Table 5-3-B-15 Work at the Start of a Career in Fisheries

	Starting Age	Starting Job	
		Crew Member	Assisting Job
Sidi Hseane	16.3	63%	38%

(2) Migration and Settlement of Fishermen

The case of Sidi Hseane differs greatly from that of Kaa Srass on the same Mediterranean coast, however, rather than this being a general feature of fisherman migration on the Mediterranean side, it is more a feature that is unique to fishermen who live in the area around Nador. The existing boat owners have only ever changed jobs between boats 1.5 times and almost none have experience of working in different areas. This is because, around 50 years ago, people of the same generation as the current boat owners regularly crossed over to Europe to find work and when they returned home they purchased fishing boats and haven't moved since. In recent times, however, work migration to Europe has steadily decreased because of the greater difficulty in obtaining visas, but instead young fishermen have come to migrate to other beaches. According to the available data, all crew members have experienced working on coastal sardine fishing boats based on other beaches at some time in their careers. Such fishermen move to find work in the neighboring large fishing ports of Al Hoceima and Nador.

Table 5-3-B-16 Migration of Fishermen

		Number of Boat Transfer Instances	Average Service Years per Boat	Ratio of Fishermen with Experiences at Other Beaches	Type of Boats Experienced at Other Beaches (Percentage)		Experienced Beach (Number of Experiences, Multiple Answers Accepted)		
					Coastal Boat	Artisanal Boat			
Sidi Hseane	Boat owner	1.5	21.6	0% (0/10)	-	-			
	Crew members	2.9	8.1 Beach average	36% (5/14) 21% (5/24)	100%	0%	Al Hoseima 5	Ras Kebhna 2	Nador 3

Environment

(1) Natural environment

Sidi Hsain is located on an alluvial fan at the eastern edge of the Rif mountains. The beach is composed of a narrow gravel band. Width of the band is about 5m. Bottom type below this band is sand. The majority of the sand is supplied by a river flowing into the beach. Because of the poor terrestrial vegetation, top soil erosion is another source of sand and silt to the sea. Water current near the beach is westbound. Benthos in the eastern side of the beach area is more affected by the sand. As for the west side, the sand has relatively strong influence on the bottom condition up to 250m distance from the western end of the beach. In this area, the growth of benthic algae is hampered by the sand sedimentation over them.

According to the president of the commune rural, the land had been largely covered with trees such as *Juniperus spp.* until 1960s. However, most of those trees were cut down during the Spanish colonial era. Currently, there are few tree vegetation. Due to the vegetation loss, top soil has been subjected to continuous erosion. Pace of the top soil erosion is unlikely so high, because the annual rainfall in this area is low. However, sooner or later , it will become more serious situation in the whole area unless the vegetation cover is restored.

2. Problems in this site

Followings are the problems which emerged at the PCM workshop. The participants were 8 fishermen. (See Problem Tree)

The Core Problem of the fishermen was that average net income (the sales of their catch after subtraction of various cost) is not sufficient. (However, their incomes are not necessarily low compared with other villages, as stated above). Other important problem for fishermen was that social infrastructure and services is scarce, though this is not directly related to the Core Problem. The fishermen had no complaint about housing, social security and safety, although these were serious problems for the other villages. The direct causes of the Core Problem are "their income from fishing is not sufficient" and "distribution cost (for production) is high (e.g. It costs 400DH to 500DH to get to Nador). The first cause can be subdivided into the two causes; "The sales volume of their catch is insufficient" and "the selling prices of their catch occasionally decline". For that reason, the structure of the problems in this site is similar to the other sites. However, the problem is not as serious as in the other villages, because the selling prices are relatively high in this site.

These direct causes can be analyzed in light of cause and effect relationship, classifying them into the following problem groups. (Also included are the important problems not directly related to the Core Problem). The items of the fishermen's main concern are shown with .

[Social infrastructure]

-* Access to neighboring cities is difficult. (Distance is long. It is impossible to use access road when there is a lot of rainfall.)

-* There is no electricity.

- There is no telephone.

[Fishing gears, fishing methods, navigation]

- Because there is no cold storage, the time for fishing is limited.

-* Access to fishing places is dangerous. (The reason for this is a lack of fishing port infrastructures described below).

[Services related to fishing]

- There is no shop in the village which sells fishing gear.
- There is no fuel station in the village (The nearest one is 7km far from the village).
- No one in the village can repair vessels.

[Fishing (production) infrastructure]

- There is no harbor facilities.

[Distribution, economic system]

- There is no cold storage for catch (Because there is no electricity).
- When it rains heavily, road conditions become extremely bad.

[Conditions of the village]

- There is no medical facilities nearby, so that no medical care has been offered. (There is a health post in Tazarine, but it is far from the village).
- There is no secondary school nearby.

3. Frame of the Development Project

The necessity of improvement of harbor facilities in this site is low, because the catch volume and fishermen's incomes are already at high level. It is also because the number of their fishing days is many. The fishery resource management for demersal fish is significant, although they use relatively good fishing boats and methods for artisanal fishing. However, social infrastructure should be more improved, especially about the roads which connect to adjacent fishing harbors and electrification. Public service such as medical facilities and education are not necessarily well provided, but it is of low priority. Following is the summary of the PDM, which was framed based on the analyses (Problem Analyses, Objectives Analyses) of the results of PCM workshop.

1) Overall Goal: The living standard of the local resident in this commune will be improved.
(Indicator) 1. Average income per fisherman will remarkably increase.
2. Income per household will remarkably increase.

2) Development Targets

(1) Basic social infrastructure. (electricity, road) will be improved. (Indicator: electrification and improvement of road conditions)
(2) Selling prices of catch will arise. (Indicator: rise in net selling prices by species)
(3) Fishery resources will be utilized more efficiently and in "sustainable" way. (Indicator: fishing of appropriate volume and sizes of fish)
(4) Transportation cost for fishing will be lowered. (Indicator: decrease in both time and financial cost)

3) Outputs

(1) Electric facilities will be improved. (Indicator: not discussed)
(2) Roads will be repaired/improved. (Indicator: number of the points to be repaired, length of pavement)
(3) Quality of marine products for sale will arise. (Indicator: improvement of preservation and production methods for marine products)
(4) Resource management will be appropriately executed. (Indicator: review of existing regulations for resource management, appropriate practice of revised regulations led by fishermen's initiatives)

(5) Services related to fishing operation will be provided by local fishing shops, repair workshops and gas station. (Indicator: opening of fishing shops, workshops for repair and gas station)

4) Activities

(1) Establishment of basic social infrastructure

① Improvement in electric facilities

② Improvement of road conditions

③ Management of these facilities

(2) Establishment of Infrastructure related to fishery production

① Building of a jetty

② Building of a slip way

③ Management of these facilities

(3) Improvement of services related to fishery (based on the initiative of fishermen)

① Formation of fishermen groups

② Training of group leaders

③ Application for the utilization of land possessed by the commune

④ Settling of fishing gear shop, workshop for repair, gas station, and cold storage

⑤ Management of these facilities

(4) Improvement of fishery resource management (based on the initiative of the fishermen)

① Thorough investigation concerning the present stock size

② Revising of existing regulations about resource management

③ Practice of revised regulations

4. Action Plans by Subject

1) Basic Social Infrastructure Development Plan

Judging from geographical and social constraints, it cannot be said that social infrastructure development (main roads, electricity, water supply, etc.) in the target area has so far been carried out sufficiently. Because the environment for promoting such development has improved recently in terms of both technology and finances, it is necessary to make use of these elements in carrying out development that is suited to the local situation.

Concerning the improvement of main roads which is an essential area, in cases where the communes currently responsible for roads are unable to implement improvement projects, it is possible, via the offices of the Agence pour la Promotion et le Développement Economique et Social des Prefectures at Provinces du Nord du Royaume, to implement them as joint undertakings with the MTP or other government agencies. Moreover, it is thought that a large ripple effect could be given on the local community by constructing a new road to connect to the northern transversal road, construction of which is being advanced as a long-term project by the Agence pour la Promotion et le Développement Economique et Social des Prefectures at Provinces du Nord du Royaume.

Concerning electricity supply, because Sidi Hsaine was not included in plans for the PERG, it is necessary to make appeals to related agencies to ensure that electrification is immediately carried out under the said program. If electricity supply can be secured, not only will this provide fisheries-related with power facilities, but it will be possible to implement a whole range of village development programs.

With regard to water, electrification would make it possible to improve well pumping efficiency and to use river water for agricultural purposes, and this would boost the income of local inhabitants and prevent

surface soil washoff through aiding vegetation growth.
The construction of social service facilities such as schools and a clinic, etc. is almost impossible due to the small size of the local population. Therefore, the most realistic solution is to provide vehicles and other means of transport to give inhabitants the means of travelling to neighboring cities to receive such services.

2) Fisheries Infrastructure Development Plan

(1) Development Contents

Since fishing boats already make around 200 fishing trips per year, the fishing port facilities plan will be prepared with the main objectives of improving the efficiency and safety of fish landing, boat laying-up and other work. Even if slipway facilities, etc. are designed directly facing the sea, judging from the current number of fishing trips, it has been judged that a sufficient operating rate can be achieved. Since these facilities will face on to the sea, thought will need to be given to securing sufficient wave resistance in terms of structure. Moreover, as the facilities will be located close to the river which continually carries sand, it is necessary to design and construct the facilities in a manner that ensures usage is not hindered even in the event where sand accumulation occurs to the front of the facilities. In the study, two development alternatives were examined: Alternative 1 in which full-scale port facilities consisting of breakwaters, revetment and land facilities are constructed, and Alternative 2 in which simple landing facilities consisting only of a slipway and land facilities are constructed.

The layout envisaged in Alternative 1 is indicated in Figure 1. In order to secure a water depth where bottom drift sand does not arise, the facilities are planned on the north-east side of the rock line where the seabed gradient is relatively steep. The facilities are located to the north-west of the existing landing beach and access is provided by the road that runs along the beach from the main road. In terms of facilities layout, the breakwater stretches eastwards from the rock line and the waters behind this are used for anchorage. Moreover, a backup breakwater is provided in order to check sand that is carried down by the river and by waves along the beach line. The depth of water at the port entrance between the two breakwaters is set at -8 m based on findings of the field survey. Land where the rock line has been cut away is used for the land facilities.

The layout envisaged in Alternative 2 is indicated in Figure 1. In terms of overall layout, by making use of the rock line which lies to the west of the existing landing beach and blocks wind and waves coming from the west, the facilities are positioned to the north of existing facilities. Since the natural rock face made from the shore reef inlet on the north side is also used, the only required fishing port facility is a slipway. This is positioned out to sea so that space for a boat laying-up area can be secured to the rear. Moreover, the west side of the slipway buries the existing shore reef and thus secures space for the land facilities. By constructing a breakwater to prevent drift sand from the beach and to block waves, the accumulation of sand in front of the slipway is reduced. In this alternative, the scale of facilities is small, however, in the event where expansion is carried out in the future, it is possible to extend the breakwater to the limit depth of sand drift and form an enclosed anchorage of calm waters.

It is considered that infrastructure for fisheries marketing, which is the same in both alternatives, will consist of a fish market, ice making and ice storage facilities and a fisheries store room. Since flat land on the planned sites is limited, the rock line will be partly broken up to provide stone building materials and secure additional land. As for the fish market, because it will handle both demersal fish intended for export and pelagic fish such as sardines, etc. intended for domestic consumption, the facilities will need to be designed accordingly. Concerning the ice making and ice storage facilities, in consideration of the long-distance transportation of sardines to inland areas, these will have the capacity to produce ice that

is equivalent to 20% the weight of transported fish.

(2) Project Cost

the cost required for the above-mentioned fisheries infrastructure development project is 67,036,500 DH in Alternative 1 and 37,111,500 DH in Alternative 2.

(3) Operation and Management Plan

Of the fisheries-related infrastructure, the fish market will be operated by the Fisheries Public Corporation (ONP: Office National des Peches). As a rule, the ONP will assign two market operating staff (one manager and one employee) to mediate the sale of fish by auction between fishermen and agents, although more staff may be assigned depending on the size of catches. The staff will collect 5% of the auction price as commission for their services, and this will be the sole source of income for the ONP at the market. From the said income, the ONP will pay personnel expenses, heating and lighting expenses and market facilities maintenance costs. Moreover, 2% of the said 5% commission charge will be returned to the fishermen in the form of a social security contribution (for pensions, life insurance and hospital cost subsidization, etc.).

The other land facilities (fishermen's lockers, workshop, ice making and ice storage facilities, toilets and hamam, refueling facilities, etc.) will be operated and managed by a new body to be newly organized around the local fishermen's cooperative association. The main work areas of the new body are as follows.

① Landing and handling (landing of fish from boats and carrying to the fish market)
② Ice retailing (sale of ice for marketing purposes)
③ Ice storage rental (leasing of ice storage space for temporary storage of long line bait and unsold fish)
④ Fuel retailing (procurement and sale of tax-free gasoline)
⑤ Facilities rental (leasing of fishermen's lockers and the workshop, etc.)
□ Fisherman services (operation of hamam or local style showers)

The operating organization will be divided into a steering committee, to act as the decision making organ, and an executive organ. The steering committee will be composed of the manager of the DRAM in Nador and fisherman and commune representatives, whereas the executive organ will be made up of full-time staff employed by the steering committee. As a rule, staff will be recruited from the local area, however, if no suitable human resources exist, especially to fill the specialist roles of management, accounting and ice making and ice storage engineering, recruiting will be carried out in the nearest city. It is intended for the operating body to function on a self accounting system based on income derived from the above-mentioned services.

Financial and technical support will be secured from the Ministry of Public Works for implementing port facilities maintenance. For example, concerning drift sand, although the facilities are structurally designed to limit sand accumulation as much as possible, in the event where drift sand obstructs the port entrance or sailing routes, dredging will be consigned to the Office des Portes of MTP and the ODEP.

3) Fisheries-related Services Development Plan

Fisheries-related service facilities include a fisheries center, workshop, fishermen's lockers and fisheries-related welfare building. Since public electricity and water supply cannot be expected in the near future, private generators run by diesel engine will be operated and well water will be pumped up to provide power and water for the ice making and ice storage facilities and all the other facilities. A shallow well will be excavated in the river basin close to the project site and will be used for the sole benefit of the facilities.

Concerning the access road that links the site to the main road, since this has steep gradients and is not suited to passage by large vehicles, it is necessary to improve it in line with improvement plans being compiled for the main road. Moreover, because the main road to Tizirhine is very steep and has sharp curves, passage by large vehicles such as works trucks and tank lorries is difficult and immediate improvement is necessary.

4) Improvement of Fisheries Resource Management

Pelagic fish resources in the waters around Sidi Hsaine seem to be in a sound state. Concerning demersal fish resources, it is difficult to judge the resource condition due to insufficient data, however, judging from the fact that the sampled landed catches were small and trawlers operate in waters close to the coast, there is no room for complacency. Even with respect to pelagic fish resources, environmental factors can change the resource condition, the same fishing grounds are fished by coastal purse seine fishing boats and, depending on the conditions of resources use by countries in Europe (Spain, Italy, etc.) and North Africa, there is a possibility that the size of catches will go down.

As a result of fisheries production infrastructure development and improvement in catching efficiency, it is forecast that the fishing effort will increase by around 6% and catch sizes by a similar amount, however, the presently available data are not sufficient to estimate the volume of local resources and accurately forecast the size of catches. For resource management to be effective, the understanding and cooperation of fishermen are essential, but it is also necessary to collect scientific information that can convince the fishermen of the need for resource management. Taking the opportunity provided by infrastructure development, it is important that the resource monitoring and management setup be bolstered.

(1) Monitoring of Resources

A setup which reports on the quantity of all landed fish and shellfish by fishing method and fish type for each fishing boat will be established. Moreover, the ONP will record the weight and sale price for each fishing boat of fish that are put up for auction in the fish market. Upon determination of the facility improvement plan, ONP would begin preparatory work for the foregoing setup, including dispatch of personnel to commence collection of sampling data.

Concerning sardines and anchovy, which are the most important fish caught in the area, records will be kept of fish types, sizes, catch quantities, water temperature and changes in fishing grounds. Also, requests will be made to European countries (Spain, e.g.) to provide cooperation in collecting and building data (roe surveys,) for forecasting fishing conditions. Through carrying out year-round sampling, surveys of fish body length and weight by sex and fecundity conditions will be implemented and understanding gained on the current conditions and distribution of resources. Moreover, survey should be conducted by actually going out to the sea and fishing conditions as well as fixed point fishing survey, surveys will be made of resource volumes. Also, suitable sites for nurseries and other protected zones will be selected.

These survey activities will be implemented by the INRH, however, it is desirable to see the establishment of special teams to survey artisanal fisheries and provide training and education throughout eastern districts on the Mediterranean Sea side including Sidi Hsaine. Such teams would be composed of three experts in the fields of fisheries resource biology, fishing gear and methods and fisheries economies and would patrol landing sites in a survey ship.

Equipment that is necessary in order to implement such monitoring activities includes computers, weighing and measuring apparatus and a small survey ship to be used for surveying waters between Nador Province and Al Hoceima Province. It is desirable that the survey ship be less than five tons and be installed with an inboard motor, fish finder and GPS. It is necessary that ship deployment be done simultaneous to the facility construction works.

(2) Resource Management Setup

The number of artisanal fishing boats using Sidi Hsaine and surrounding landing sites will be strictly monitored. When fishing boats are registered or move to new sites depending on the season, their obligation to report to the DRAM will be strictly enforced. For this reason, a system needs to be established whereby fishermen receive some benefit through registering, and this issue will be examined by the fishermen's cooperative association. Generally speaking, the new building of artisanal fishing boats will not be allowed and size limitations, etc. will be placed on the building of boats for replacement. Numerous opportunities will be taken to explain the importance of existing fisheries regulations to fishermen, and regulations will be enforced more strictly at landing and selling sites.

The level of fishermen in Sidi Hsaine is very high in both technical and economic terms compared to fishermen based on the Atlantic Ocean side and, since fishermen's homes are situated close to the beach and all the members of large families are involved with fisheries, a strong bond appears to exist between fishermen here. In view of this, Sidi Hsaine is now at the stage where education and guidance should be provided to encourage fishermen to actively make a joint effort in regulating the mesh size of nets, working to establish protected zones and refraining from catching fish during the spawning season. In unison with the improvement of fishing methods, it is considered that the thinking and awareness of fishermen in Sidi Hsaine can also be reformed.

Simultaneous to determination of the facility plan, it is essential that the activities by the DRAM be commenced.

5. Project Evaluation

Since two alternatives - full-scale fishing port construction including breakwaters, and simple landing facilities construction without breakwaters - have been put forward as the project for fisheries infrastructure development in Sidi Hsaine, both are evaluated.

1) Financial Analysis

(1) Project Cost

Concerning the initial investment cost that will be put into project implementation, the facilities construction cost is calculated based on general construction rates (tax-separate) in Morocco, and the equipment supply cost will be based on local prices with respect to locally procured items and prices in Japan with respect to imported items. In addition, a consultant supervision cost equivalent to 8% of the total equipment supply cost is also taken into account. Land acquisition cost is not counted because the project site is located on state-owned land. Operating costs following the completion of facilities are calculated based on prices in Morocco. The breakdown of these costs is indicated in Table 17 (Alternative 1) and Table 18 (Alternative 2).

(2) Project Benefit

The effects that can be anticipated as a result of project implementation are as follows.

① Increased fishing trip days (this benefit is not so large in Alternative 2)
Effect gained through fishing port facilities development

② Increased operating time (common to both alternatives)
Effect gained through ice storage installation. In other words, fishermen can decide when to return to port without being limited by the activities of agents.

③ Increased fish prices (common to both alternatives)
Effect gained through realization of total competition between agents via the fish market

④ Improved quality of handled fish (common to both alternatives)
Effect gained through use of ice

⑤ Reduction of fisheries-related expenses (common to both alternatives)
Construction of the slipway will make fishing boat maintenance easier and extend the service lives of boats. Moreover, through provision of the workshop, fishing gear store and long line bait store, time that was previously spent on procuring outboard engine parts, fishing gear and bait will be saved.

Specific effects in the event of Alternative 1 implementation are as follows.

A. It is forecast that the annual landed quantity of fish will increase by approximately 6% from the present 1,442,378 kg to 1,528,996 kg.

B. It is forecast that average fish prices will increase by approximately 5% from the present:

① 6.4 DH/kg to 6.7 DH/kg (sardines caught by purse seine),

② 30 DH/kg to 31.5 DH/kg (tuna caught by long line),

③ 22.7 DH/kg to 23.8 DH/kg (demersal fish caught by artisinal fishing).

Specific effects in the event of Alternative 2 implementation are as follows.

A. It is forecast that the annual landed quantity of fish will increase by approximately 5% from the present 1,442,378 kg to 1,514,996 kg.

B. It is forecast that average fish prices will increase by approximately 5% from the present:

① 6.4 DH/kg to 6.7 DH/kg (sardines caught by purse seine),

② 30 DH/kg to 31.5 DH/kg (tuna caught by long line),

③ 22.7 DH/kg to 23.8 DH/kg (demersal fish caught by artisinal fishing).

The profits which these project effects will bestow on the operating body are as follows. The breakdown of these benefits is indicated in Table 19 (Alternative 1) and Table 20 (Alternative 2).

① Landing commission
6% of auction sale prices at the market will be levied, 1% of which will go to the fishermen's cooperative association and 5% to the ONP.

② Ice sales

③ Fuel sale commission
For every liter of fuel sold, 0.2 DH will be levied as a commission charge.

④ Facilities leasing charge
Charges from the lease of fishermen's lockers, the workshop and stores, etc.

⑤ Other income
Canteen sales and hamam charges

6 Fishermen's cooperative association contribution
In the first year only when the fishermen's cooperative association is established, a contribution will be levied from fishermen who join the association.

Incidentally, concerning the residual value of the initial capital investment, this is not taken into account because the target facilities are largely intended to serve the public benefit.

(3) Project Profitability

It is not possible to calculate the FIRR for both alternatives, as is indicated in the calculation table shown in Table 21 (Alternative 1) and Table 22 (Alternative 2). Because the sum total of the net present value is already negative when the discount rate is set at 1%, any further calculation is impossible. In other words, even before a comparison with the long-term rate of interest is made, it is clear that the project cannot make a profit on investment.

Sensitivity analysis was carried out to find the FIRR by varying expected increase in the quantity and average price of landed fish. Three scenarios each were assumed in each alternative: In Alternative 1, the landed fish quantity was assumed to increase by 3%, 6% and 9% and the average fish price by 3%, 5% and 7%, whereas in Alternative 2, the landed fish quantity was assumed to increase by 2%, 5% and 8% and the average fish price by 3%, 5% and 7%. However, it was not possible to calculate a value in any of the assumed cases.

2) Economic Analysis

(1) Project Cost

Using the same cost items as those adopted in the financial analysis, only the prices are corrected, from market prices to shadow prices. In other words, concerning the initial investment cost, the facilities construction cost is multiplied by the shadow construction coefficient, and the equipment supply cost is multiplied by the shadow exchange rate with respect to imported items and by 1.0 with respect to locally procured items. Concerning operating costs, personnel expenses are multiplied by the shadow labor coefficient with respect to unskilled labor, and transfer items such as TVA, etc. are deducted from other expenses such as lighting and heating costs, etc. Concerning the value of land that is lost as a result of facilities construction, this is not taken into account because it is currently sand beach not used for any particular production activities. The breakdown of these costs is indicated in Table 23 (Alternative 1) and Table 24 (Alternative 2).

(2) Project Benefit

The following three benefits can be anticipated as a result of project implementation.

① Increased quantity of landed fish (the extra amount will contribute to increasing the amount of fish exported and the amount supplied to the domestic market)

② Increased fish prices

③ Ice production volume

The value of the increased amount of fish for export is first converted to the FOB price in force at the main trade port of Nador (domestic marketing coefficient: 1.15) and then multiplied by the shadow exchange rate (1.14). In the economic analysis, since the consumer surplus resulting from project implementation is also treated as a benefit, the value of the increased amount of fish for supply to the domestic market is calculated by converting the price in the production area to the price in the main consumer area of Nador market. Concerning increase in the volume and price of landed fish, the same anticipated values as used in the financial analysis are adopted. The breakdown of these benefits is indicated in Table 25 (Alternative 1) and Table 26 (Alternative 2).

The construction of refueling facilities, a fishing gear store and outboard engine workshop under the project will result in a cost saving benefit in that time previously spent traveling to the nearest such facilities can be saved on, however, by assuming that this benefit will translate into greater operating time and thus increased catches, it is not treated as a separate item.

Income from commission and lease charges, which is taken into account in the financial analysis, is not considered in the economic analysis since it is viewed as domestic transfer of services.

(3) Level of Priority of the Project

The EIRR is incalculable for Alternative 1 and 1.14% in Alternative 2. The calculation table is shown in Table 27 (Alternative 1) and Table 28 (Alternative 2).

Sensitivity analysis was carried out upon correcting the quantity and average price of landed fish following project implementation in the following way.

Table 5-3-B-32 EIRR Sensitivity Analysis (Alternative 1)

Increases in Landed Quantity	Increases in Average Fish Price	FIRR
3	3%	Incalculable
	5%	Incalculable
	7%	Incalculable
6%	3%	Incalculable
	5%	Incalculable
	7%	Incalculable
9%	3%	Incalculable
	5%	Incalculable
	7%	1.10

Table 5-3-B-33 EIRR Sensitivity Analysis (Alternative 2)

Increases in Landed Quantity	Increases in Average Fish Price	FIRR
2%	3%	Incalculable
	5%	Incalculable
	7%	1.19
5%	3%	Incalculable
	5%	1.14
	7%	2.96
8%	3%	Incalculable
	5%	2.79
	7%	4.48

In the case of Sidi Hseine, because topographical conditions of the landing beach and ocean conditions are more severe than in the other target fishing villages, it is only possible to consider the construction of a full-scale fishing port at the expense of profitability or the construction of the bare minimum facilities. If a breakwater of insufficient length is constructed out of a desire to reduce capital expenditure, there is a strong possibility that the port will eventually become blocked up with drift sand. In Alternative 1, where there is no possibility of this happening over the long term, the initial capital expenditure is too large to be recovered by the benefit and calculation was not possible in almost all the cases assumed in the sensitivity analysis. However, in a fishing village such as Sidi Hseine which is almost like a remote island on land, implementation of either project alternative will attract social infrastructure development (roads, electricity, etc.) and thus lead to greater movement of people, goods and money and a better standard of living. Moreover, development of the fisheries infrastructure, in addition to increasing income from fisheries, will generate a number of indirect benefits that cannot be converted into money, for example, fishermen and their families will feel a greater sense of security in their lives through being able to enter the social security system that is provided by the ONP.

3) Environmental Impact Assessment

(1) Natural environment

① Impacts of fishing port construction

The project plan includes only construction of a break water and a slip way, and their scale is relatively small. Thus, the project will have only a small impact on the benthic ecosystem in the area. However, we observed sand influence in the area from the mouth of the river to 250m north of it. It is strongly recommended that sand influence should be carefully examined at the time when a fishing port is designed in the future.

② Impacts by constructing land facilities

The project will have small direct impacts on ecosystem in this area, because land ecosystem is already poor, and construction of fishery port and other land facilities is limited in its scale. However, special

attention should be paid to the impacts of traffic problem caused by the construction. Access road to the beach is narrow and sharply curves in valleys. Furthermore, shoulder of the road on the valleys is fragile. Thus, it is necessary to widen and reinforce the road so that large vehicles can pass to carry construction materials. Full scale reconstruction of the road will be done with a support from the Agence pour la Promotion et le Développement Economique et Social des Prefectures at Provinces du Nord du Royaume, however, repair of the road for the traffic of construction vehicles should be finished before the project starts.

In addition, as it has been described before, land soil has been eroded. Although speed of the erosion is not so high, a measures such as afforestation should be taken into account in the long run in order to protect the road and the soil.

(2) Social Environment

① Compulsory Transfer During the Works Period

During the works period, it is forecast that the two cafes and fishermen's lockers on the beach will need to be removed in order to secure an access road and work space. Therefore, it is necessary to consider compensation to the owners during the works and the construction of new facilities following completion of the works.

② Impact on Relationship Between Fishermen and Middlemen

Since fishermen already rely very little on middlemen, establishment of the public fish market, will not adversely affect the relationship between these two parties; indeed, agents are actually hoping that a fish market will be established.

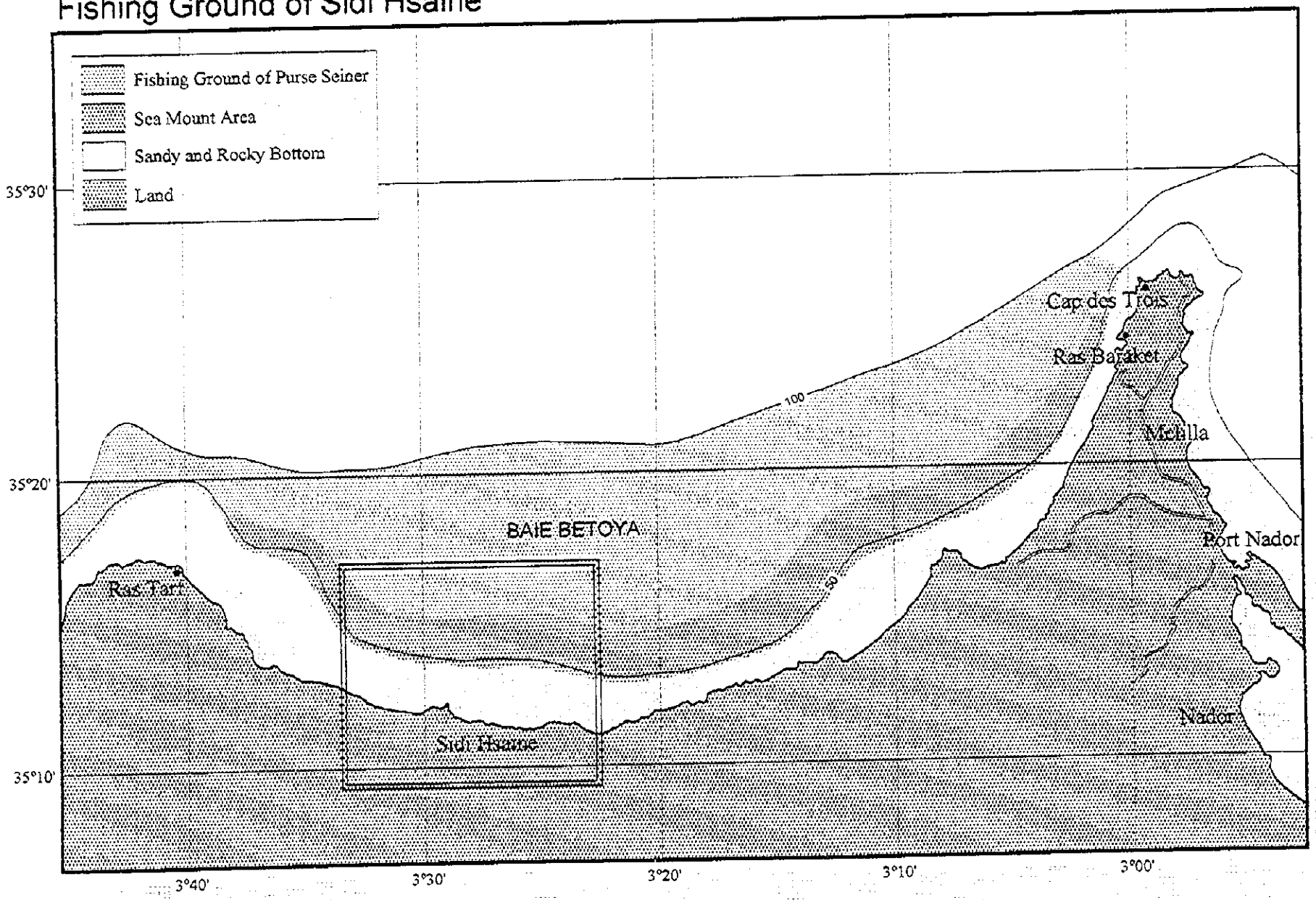
③ Population Movement to Areas around the Project Site

In view of the limited amount of available land around the project site, no major concentration of population will occur in surrounding areas. Moreover, by extending the access road between Tizirhine and the beach further to the opposite bank of the river where fishermen also live, the need for people to move house will be further checked. Number of people currently working abroad who return to Sidi Hseine following development of the fisheries infrastructure increase, however, this should not be on a level big enough to create a population problem.

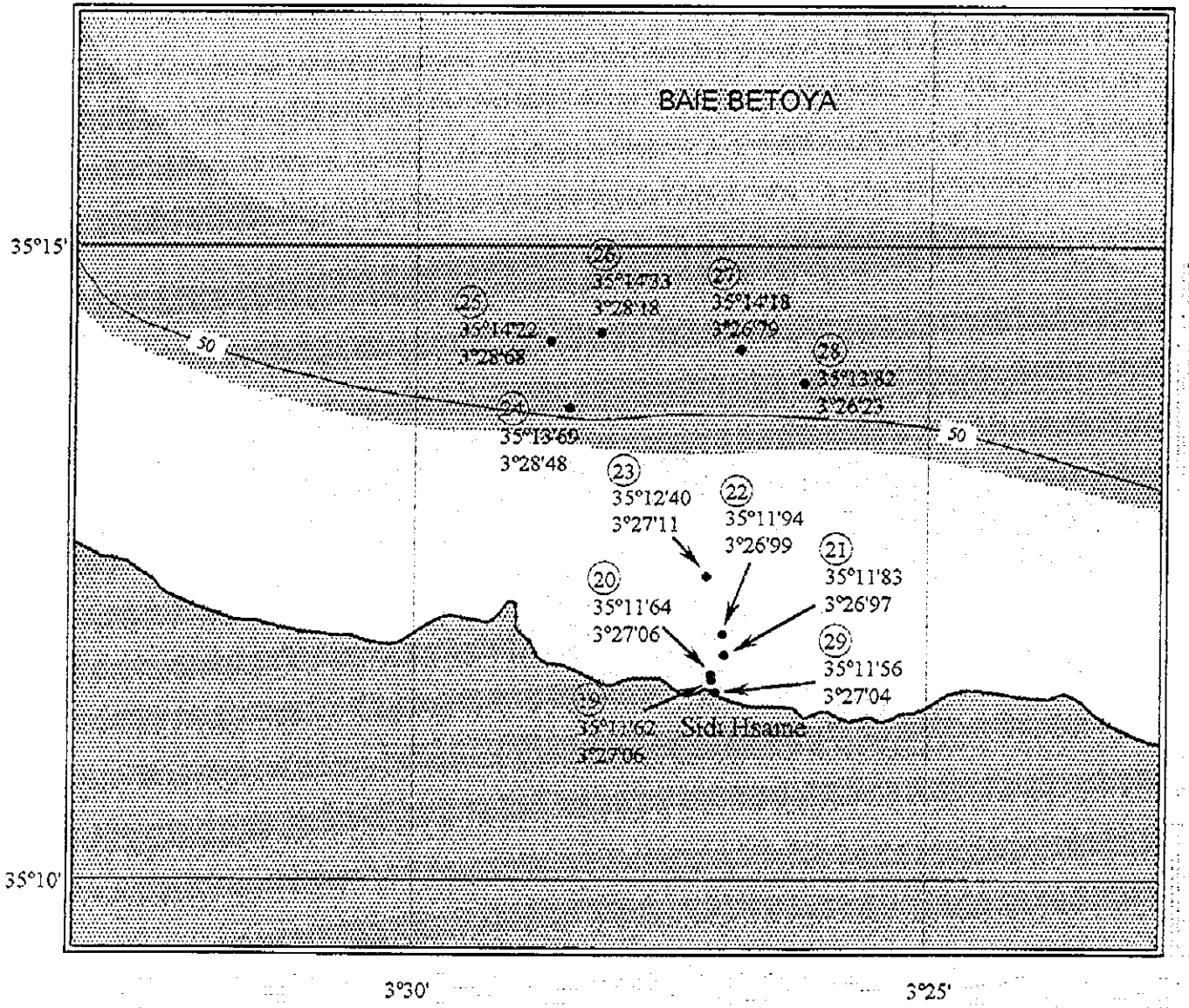
④ Solid Waste and Odor Generation

Since it is possible that solid waste and odor will be generated from the fish market, waste dump and toilets, it is necessary to consider the implementation of autonomous cleansing activities by local inhabitants.

Fishing Ground of Sidi Hsaine



Mesurement Points of Fishing Ground of Sidi Hsaine



Global Positioning system (GPS) Data
Sidi Hsaine

Sand=S Rock=R

Location	Latitude	longitude	Location indicator or name	Bottom material	Depth m	Temp. ℃	Observation
LKM19	35° 11′ 62 N	003° 27′ 06 W	Small rocky bay of Sidi Hsaine (SH)				A couple of seiners were moored
LKM20	35° 11′ 64 N	003° 27′ 06 W	Just off SH				
LKM21	35° 11′ 83 N	003° 26′ 97 W		R	10	23.4	
LKM22	35° 11′ 94 N	003° 26′ 99 W		R	13	23.2	Trammel net fishing ground for Sea breams
LKM23	35° 12′ 40 N	003° 27′ 11 W		R	29	23.1	Hand line boat was fishing for Sea bream, Grouper, Sea bass
LKM24	35° 13′ 69 N	003° 28′ 48 W	Sardine fishing ground starts here		57		Fish schools were located by the fish finder
LKM25	35° 14′ 22 N	003° 28′ 68 W			50		Fish schools were located by the fish finder
LKM26	35° 14′ 33 N	003° 28′ 18 W					Fish schools were located by the fish finder
LKM27	35° 14′ 18 N	003° 26′ 79 W		R	65	23.7	Fish schools were located by the fish finder
LKM28	35° 13′ 82 N	003° 26′ 23 W					Fish schools were located by the fish finder
LKM29	35° 11′ 56 N	003° 27′ 04 W	Just off the landing beach of SH				

Fishing ground infromation of Sidi Hsaine

Small Seiner's fishing ground is from Al Hoseima to Cap Trois Rouches. The water depth is approximately up to 100 m.
From the sardine fishing ground in front of SH, it take 5 hours to Nador and 6 hours to Al Hoseima.
Threr is a sea mount area running along the 45 to 50 m water depth line. It runs approximately 10 km from the shore line.
Artidanal boat's fishing ground is from Ras Tarf to Ras Baraket. The water depth is usually up to 60 m.
Thre is a cold water spring in the ocean one hour from Sidi Hsaine.

PROBLEM TREE
Workshop for Sidi Hsaine
(Oct. 1)

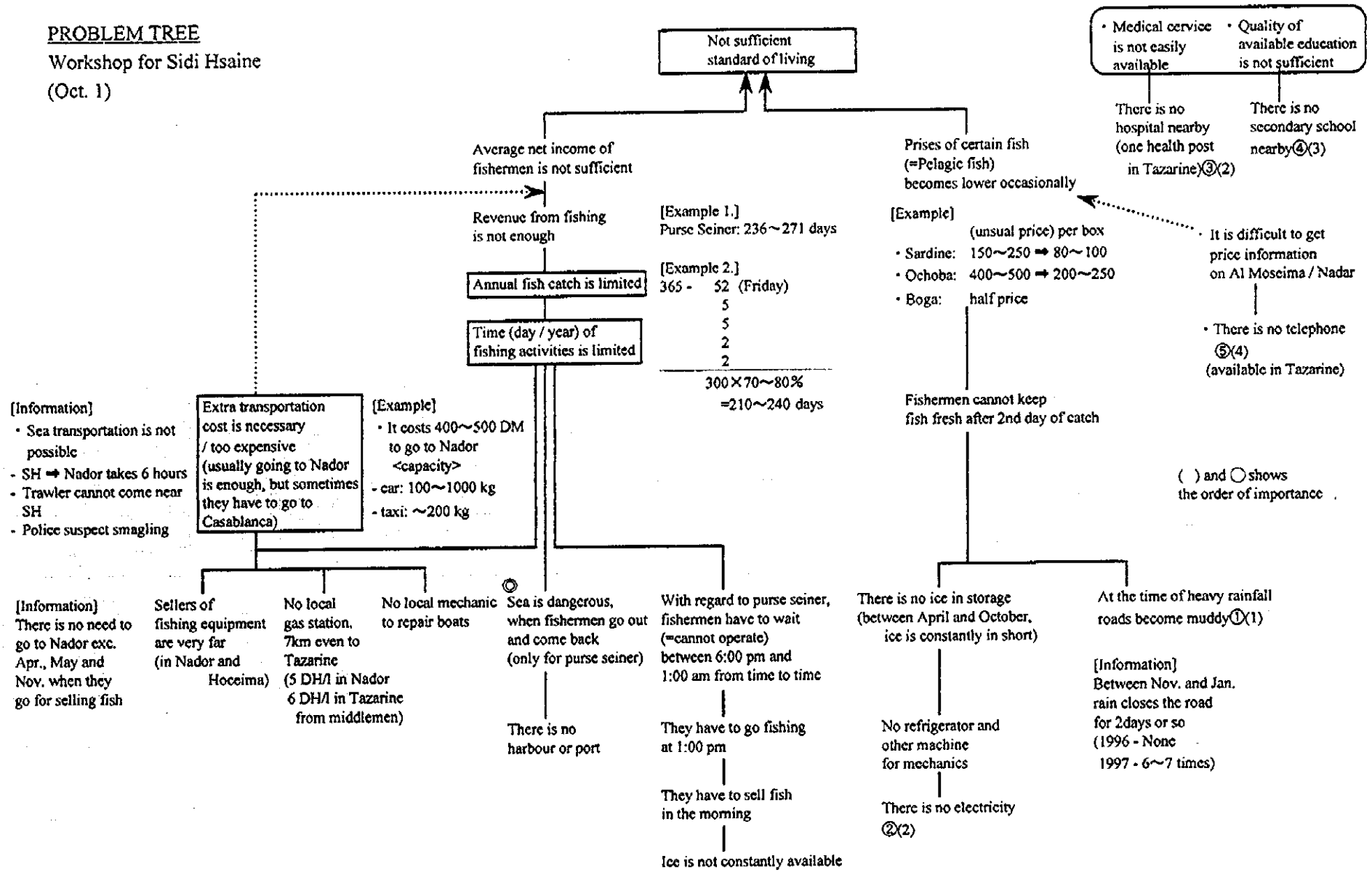


Fig. 5-3-B-4 Problem tree

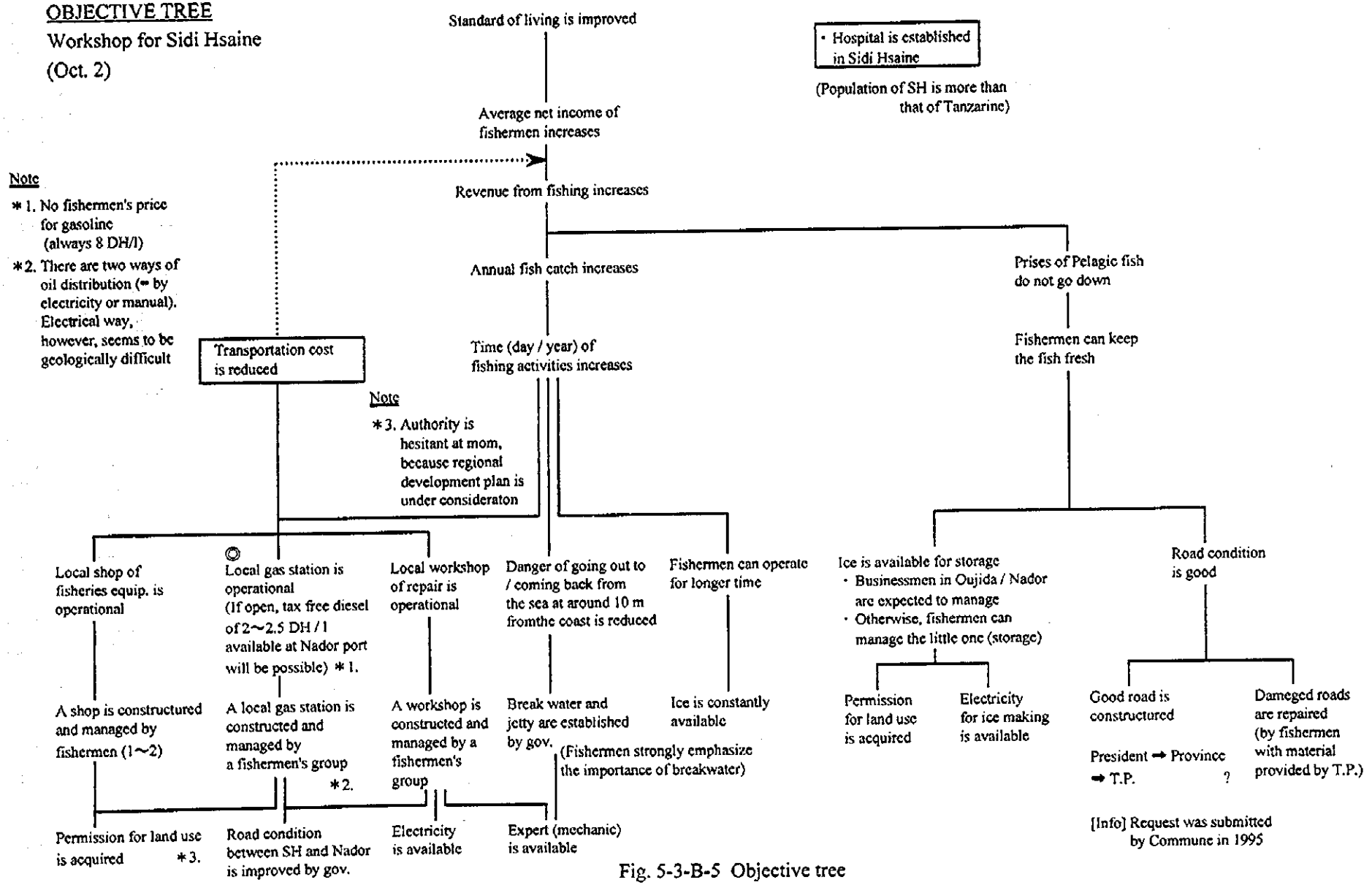
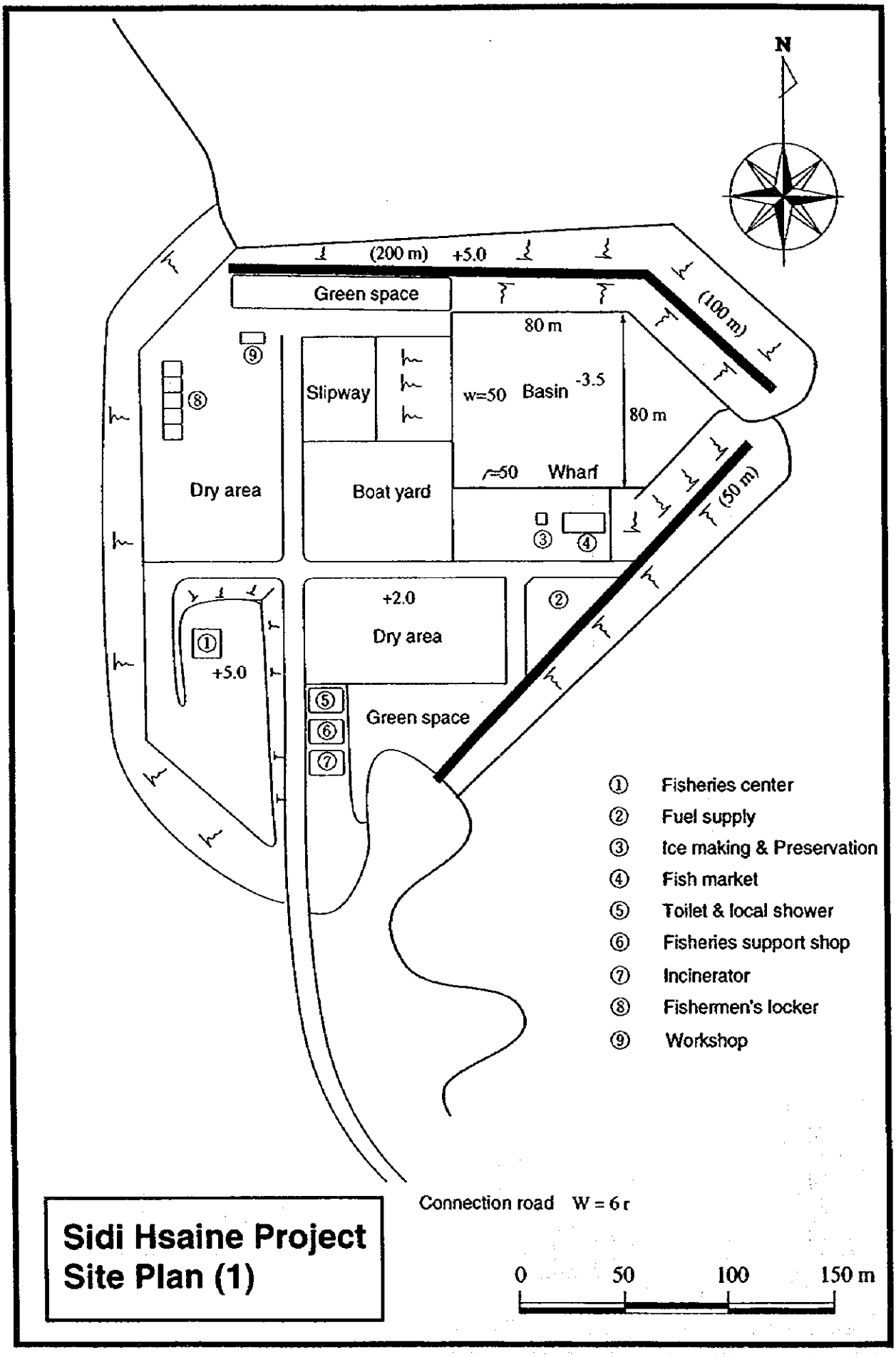
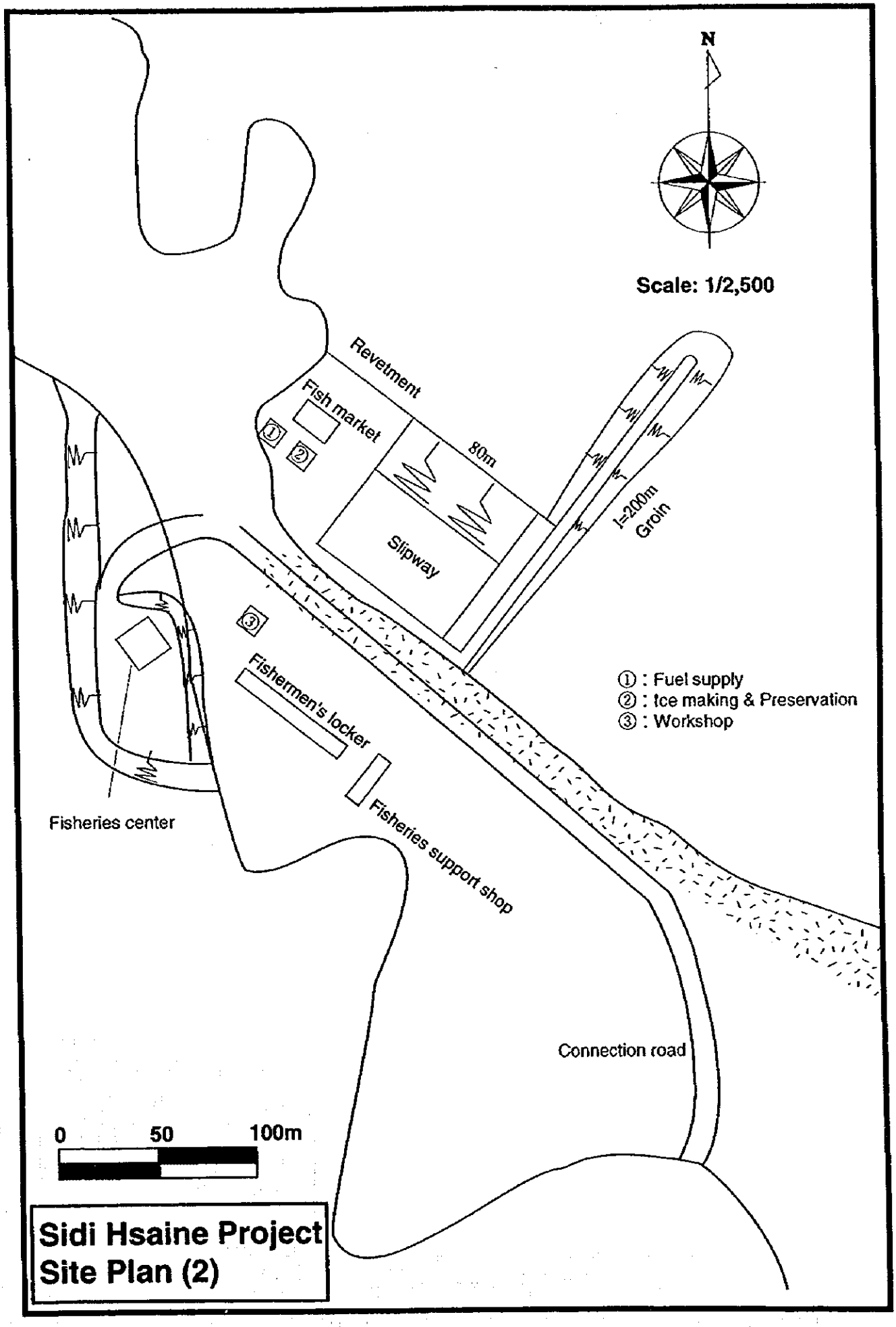


Fig. 5-3-B-5 Objective tree



Sidi Hsaine Project
Site Plan (1)


N
Scale: 1/2,500
Revetment
Fish market
①
②
80m
Slipway
L=200m
Groin
③
Fishermen's locker
Fisheries support shop
Fisheries center
① : Fuel supply
② : Ice making & Preservation
③ : Workshop
Connection road
0
50
100m
Sidi Hsaine Project
Site Plan (2)

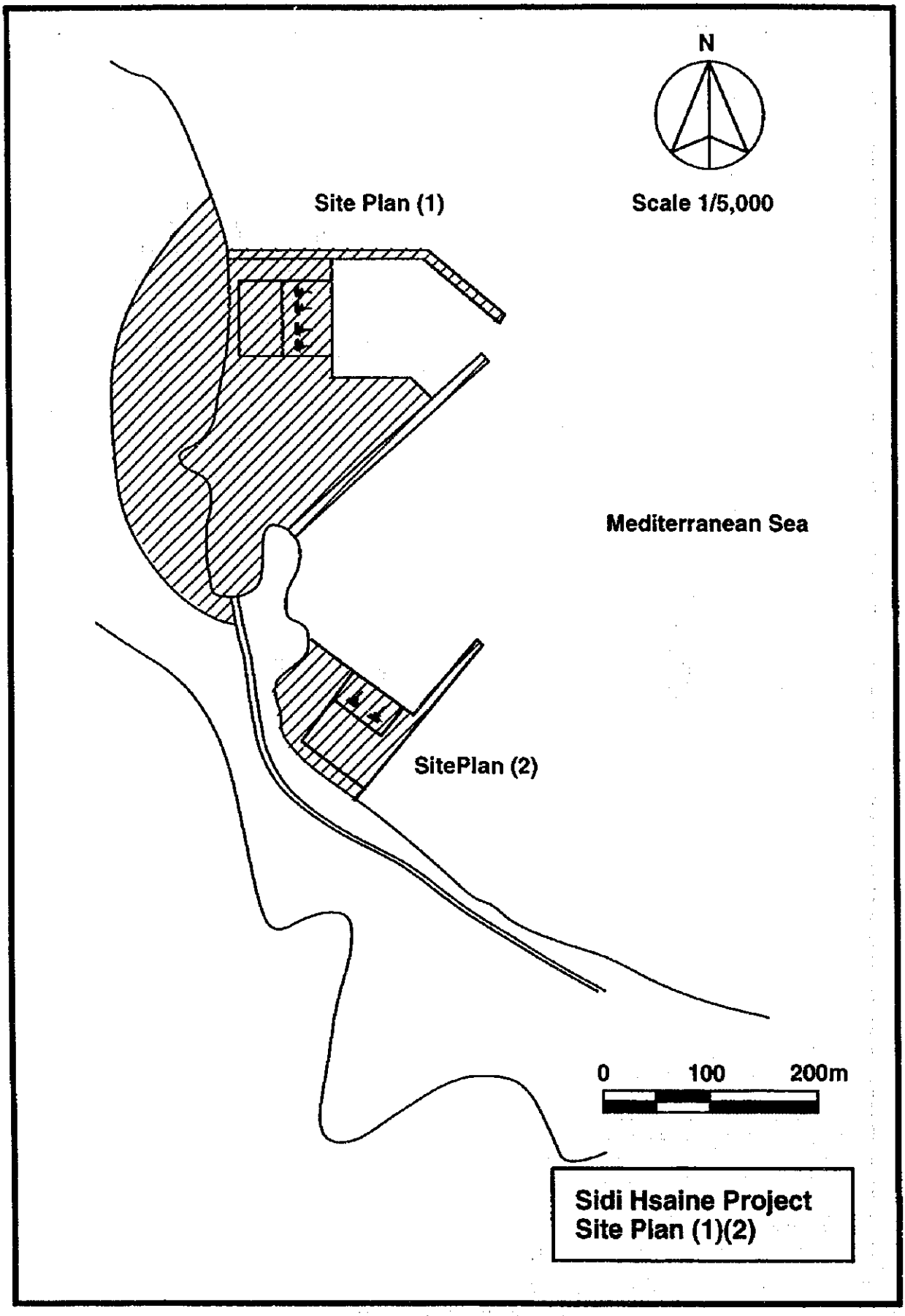


Fig. 5-3-B-6 Site Plan (both plan-1&2)

Project Design Matrix (PDM) on Sidi Hsaine 1/4 (First Draft)

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal General standard of living of residents in commune including Sidi Hsaine is increased.	(With the time frame of 10 years for example) 1. Significant increase of an average net income of fishermen per person (estimate) 2. Significant increase of average household income of residents (estimate)	1. and 2. Survey (random sampling)	(Important external conditions to make overall goals sustainable, in addition to the already mentioned assumptions stated below) 1. There is no significant change in the governmental policies on artisanal fisheries.
Development Targets 1. Basic social infrastructure (electricity, better road) is operational. 2. Fish sales prices are more stable. 3. Fisheries resources are optimally utilized. 4. Transportation cost related to fisheries activities is reduced.	(With the time frame of 5 years for example) 1. Availability of electricity and shorter transportation time between SH and Tazarine 2. Stable sales price of Pelagic fish 3-1. Optimum fish catch 3-2. Optimum size of caught fish 4. Decrease of cost such as expenditure, frequency and time of transportation	1.Official record of use of electricity Survey 2. Sales record of public auction 3-1. Sales record of public auction 3-2. Survey 4. Survey	1.Quality of existing basic public services such as education and medical service and basic social infrastructure is maintained. 2. Residents' income from sources other than fishing is maintained.

Project Design Matrix (PDM) 2/4

Outputs 1. Facility related to electricity is established. 2. Roads are repaired / improved. 3. Quality of fish is well maintained. 4. Fisheries resource management measures are properly undertaken. 5. A local shop of fisheries equipment, a workshop of repair, a gas station are operational.	1. Electricity related facilities? 2. Number of repaired points of roads and length of improved roads 3. Improved quality control 4-1. Revision of resource conservation regulations 4-2. Introduction of community based resource management 5. Establishment of a local shop of fisheries equipment, a workshop of repair and a gas station	1. Administrative record 2. Administrative record 3. Survey 4-1. Document 4-2. Administrative record of relevant authority 5. Survey	1. Demand for fish does not decrease. 2. There is no weather extreme or other significant change of natural environment which affects fishing activities.

Project Design Matrix (PDM) 3/4

Activities (expected persons/organizations in charge are shown by symbols; G-government/public organization, C-commune/fishermen, P-private business sector)	Input	
1.Basic social infrastructure improvement 1) To undertake necessary construction of electricity related facilities (G) 2) To undertake necessary improvement or repair of existing roads (G) 3) To maintain and manage the infrastructure (G) 2. Fisheries infrastructure improvement 1) To establish jetty and slip way (G) 2) To maintain jetty and slip way (G)	Necessary financial input should be estimated here.	Pre-conditions 1. Government and related public agencies are cooperative to the development plan. 2. There is no influential local individuals or organizations which are against the plan.

3. Fishery supporting facilities improvement by the fishermen's initiative 1) To set up groups of fishermen (C) 2) To conduct leader training for group activities (G) 3) To acquire permission for the use of public land (G/C) 4) To build and manage the local shops of fisheries equipment, workshop of repair, gas station and storage of fish with ice (C and P) 4. Fisheries resource management 1) To conduct comprehensive resource surveys of existing fish resource (G) 2) To revise existing regulations (G) 3) To put these regulations into practice (G and C)		

Sidi Hasaine (Plan 1)

Scope of facilities		Name of facilities	Scale of facilities	Note
Port facilities	Outer facilities	North breakwater	L= 200m	
		South breakwater	L= 50m	
		Revetment	L= 250m	
	Mooring facilities	Wharf (-1.5m)	L= 49m	
		Slipway(-1.5m)	W= 52m	
	Water facilities	Navigation aids	Navigation lights : 1 set	
Port service facilities	Fish preservation facilities	Auction hall	Building area 200m2	Operated by ONP
		Ice making & preservation	Building area 100m2	
		Ice making plant	3ton/day、Ice storage 9ton	Flake
		Chilled room	3ton、30m2	Fish
	Boat & gear maintenance facilities	Warehouse	Building area 20m2	
		Workshop	Building area 40m2	Engine & hull
	Supply facilities	Fishermen's locker	Building area 925m2	60 sets、
	Fishermen's welfare facilities	Fuel supply	12kl Fuel tank	Gasoline, Operated by private
		Fisheries support shop	Building area 50m2	4 booth
	Management facilities	Toilet & local shower	Building area 30m2	Use of incinerator heat
	Treatment facilities	Fisheries center	Building area 430m2	
		Drainage treatment	Harbor area	Septic tank & subsurface infiltration
	Mulch purpose area	Incinerator		
		Dray area, parking	Simple pavement	
Fishemens village social infra-structure	Road	Connection road	Alignment, elevation improvement	Control by commune
		Fishermen's village	Improvement	with electrification
	Water supply	Water distribution	Well water	with electrification
	Electricity supply	Main & branch line	Nothing	with electrification
	Drainage & garbage treatment	Drain gutter, sewer	Nothing	with electrification
	Public facilities	Community center	No need	
		Elementary school	No need	
Equipment	Fish handling equipment	Fish box, balance, cart, etc.		
	Workshop tools			
	Multipurpose car	Boat pull up, mobilization		

Sidi Hasaine (Plan2)

Scope of facilities		Name of facilities	Scale of facilities	Note
Port facilities	Outer facilities	Groin	L= 200m	
	Mooring facilities	Slipway(-1.5m)	L= 80m	
	Water facilities	Navigation aids	Navigation lights : 2 sets	
Port service facilities	Fish preservation facilities	Auction hall	Building area 200m2	Operated by ONP
		Ice making & preservation	Building area 100m2	
		Ice making plant	3ton/day、Ice storage 9ton	Flake
		Chilled room	3ton、30m2	Fish
	Boat & gear maintenance facilities	Ware house	Building area 20m2	
		Workshop	Building area 40m2	Engine & hull
	Supply facilities	Fishermen's locker	Building area 925m2	60 sets、
	Fishermen's welfare facilities	Fuel supply	12kl Fuel tank	Gasoline, Operated by private
		Fisheries support shop	Building area 50m2	4 booth
	Management facilities	Toilet & local shower	Building area 30m2	Use of incinerator heat
	Treatment facilities	Fisheries center	Building area 430m2	
		Drainage treatment	Harbor area	Septic tank & subsurface infiltration
	Mulch purpose area	Incinerator		
		Dray area, parking	Simple pavement	
Fishemens village social infra-structure	Road	Connection road	Alignment, elevation improvement	Control by municipality
		Fishermen's village	Improvement	with electrification
	Water supply	Water distribution	Well water	with electrification
	Electricity supply	Main & branch line	Nothing	with electrification
	Drainage & garbage treatment	Drain gutter, sewer	Nothing	with electrification
	Public facilities	Community center	No need	
		Elementary school	No need	
Equipment	Fish handling equipment	Fish box, balance, cart, etc.		
	Workshop tools			
	Multipurpose car	Boat pull up, mobilization		

Table 5-3-B-20 Financial Analysis-Cost (Plan-1) (i)

Financial Analysis
Capital Expenditure (CAPEX)

Area	Facility	Scale	Unit	Unit price (DH)	Price (DH)	Remarks
Port facilities					45,250,000	
	North breakwater	200	m	125,000	25,000,000	
	South breakwater	50	m	83,333	4,166,667	
	Revetment	250	m	25,000	6,250,000	
	Wharf (-1.5m)	50	m	25,000	1,250,000	
	Slipway	50	m	33,333	1,666,667	
	Navigation aids	2	set	125,000	250,000	
	Land	80,000	m3	83	6,666,667	
Port service					16,154,167	
facilities	Fish market	200	m2	5,833	1,166,667	
	Ice & preservation	100	m2	5,833	583,333	
	Fisheries center	430	m2	5,833	2,508,333	
	Workshop	40	m2	4,167	166,667	
	Fishermen's locker	925	m2	4,167	3,854,167	
	Warehouse	20	m2	4,167	83,333	
	Fisheries support shop	50	m2	5,833	291,667	
	Drainage treatment	1	set	833,333	833,333	
	Ice making plant	1	set	2,083,333	2,083,333	
	Chilled room	1	set	1,250,000	1,250,000	
	Connect'n&insite road	500	m	3,333	1,666,667	
	External work	1	set	1,666,667	1,666,667	
Equipment					666,667	
	Fish handling	1	set	416,667	416,667	
	Workshop	1	set	250,000	250,000	
Consulting fee		1	set	4,965,667	4,965,667	
Total					67,036,500	

Table 5-3-B-21 Financial Analysis - Cost (Plan-2) (i)

Financial Analysis
Capital Expenditure (CAPEX)

Area	Facility	Scale	Unit	Unit price (DH)	Price (DH)	Remarks
Port facilities					17,541,667	
	Groin	200	m	41,667	8,333,333	
	Revetment	50	m	25,000	1,250,000	
	Slipway	80	m	66,667	5,333,333	
	Navigation aids	1	set	125,000	125,000	
	Land	30,000	m3	83	2,500,000	
Port service					16,154,167	
facilities	Fish market	200	m2	5,833	1,166,667	
	Ice & preservation	100	m2	5,833	583,333	
	Fisheries center	430	m2	5,833	2,508,333	
	Workshop	40	m2	4,167	166,667	
	Fishermen's locker	925	m2	4,167	3,854,167	
	Warehouse	20	m2	4,167	83,333	
	Fisheries support shop	50	m2	5,833	291,667	
	Drainage treatment	1	set	833,333	833,333	
	Ice making plant	1	set	2,083,333	2,083,333	
	Chilled room	1	set	1,250,000	1,250,000	
	Connect'n&insite roa	500	m	3,333	1,666,667	
	External work	1	set	1,666,667	1,666,667	
Equipment					666,667	
	Fish handling	1	set	416,667	416,667	
	Workshop	1	set	250,000	250,000	
Consulting fee		1	set	2,749,000	2,749,000	
Total					37,111,500	

Table 5-3-B-20 Financial Analysis-Cost (Plan-1) (ii)

Operation Expenditure (OPEX) | 637,773 DH/Year

Personnel Cost

Area	Title	Unit Price(DH)	No. of person	Cost (Month)
Administration	Manager	2,500	1	2,500
	Accountant	2,500	1	2,500
	Secretary	1,300	1	1,300
Ice machine	Engineer	2,700	1	2,700
	General worker	1,200	1	1,200
Workshop	Engineer	2,000	1	2,000
	Carpenter	1,400	1	1,400
Cantine	Cook	1,300	1	1,300
	Server	500	1	500
Hamam	Worker	1,200	1	1,200
Fuel Station	Worker	1,200	1	1,200
Others	Security men	1,200	2	2,400
Fish Market	Manager	2,500	1	2,500
	General worker	1,200	1	1,200
Total (month)				23,900
Total (year)				286,800

Cost of utility

Item	Use	Consumption	Unit price	Price (DH)	Remarks
Electricity	Ice machine	35	291	10,185	base charge (year)
		20,160	0.99	20,051	monthly use
	Refrigerator	216	1.27	274	monthly price
	Lights and others	768	1.30	998	monthly price
Total (year)				266,066	
Item	Use	Consumption	Unit price	Price (DH)	Remarks
Water	Fish market	100	5.83	583	monthly price
	Ice machine	180	5.83	1,049	monthly price
	Others	40	5.83	233	monthly price
Total (year)				22,387	

Maintenance and Operation Cost

facility	Cost (month)	Remarks			
Workshop	500				
Hamam	1,710	fuel cost	break down	daily consumpt'n	15
Ice machine	500			unit price	3.8
Building	500			no. of days	30
Other expenses	2,000	vehicles etc.			
Total	5,210				
Cost (year)	62,520				

Table 5-3-B-21 Financial Analysis - Cost (Plan-2) (ii)

Operation Expenditure (OPEX)	637,773 DH/Year

Personnel Cost

Area	Title	Unit Price(DH)	No. of person	Cost (Month)
Administration	Manager	2,500	1	2,500
	Accountant	2,500	1	2,500
	Secretary	1,300	1	1,300
Ice machine	Engineer	2,700	1	2,700
	General worker	1,200	1	1,200
Workshop	Engineer	2,000	1	2,000
	Carpenter	1,400	1	1,400
Cantine	Cook	1,300	1	1,300
	Server	500	1	500
Hamam	Worker	1,200	1	1,200
Fuel Station	Worker	1,200	1	1,200
Others	Security men	1,200	2	2,400
Fish Market	Manager	2,500	1	2,500
	General worker	1,200	1	1,200
Total (month)				23,900
Total (year)				286,800

Cost of utility

Item	Use	Consumption	Unit price	Price (DH)	Remarks
Electricity	Ice machine	35	291	10,185	base charge (year)
		20,160	0.99	20,051	monthly use
	Refrigerator	216	1.27	274	monthly price
	Lights and others	768	1.30	998	monthly price
Total (year)				266,066	
Item	Use	Consumption	Unit price	Price (DH)	Remarks
Water	Fish market	100	5.83	583	monthly price
	Ice machine	180	5.83	1,049	monthly price
	Others	40	5.83	233	monthly price
Total (year)				22,387	

Maintenance and Operation Cost

facility	Cost (month)	Remarks			
Workshop	500				
Hamam	1,710	fuel cost	break down	daily consumpt'n	15
Ice machine	500			unit price	3.8
Building	500			no. of days	30
Other expenses	2,000	vehicles etc.			
Total	5,210				
Cost (year)	62,520				

Table 5-3-B-22 Financial Analysis-Benefit (Plan-1)

Income (Benefit)

	1,625,147 DH/Year	
in the First year	161,000	DH added

Fish landing commission

	Landing value(year)	Rate	Commission	Remarks
Fishery Coop.	16,633,385	1%	166,334	DH/year
ONP	16,633,385	5%	831,669	DH/year
Total			998,003	

Commission for fuel sales (L: litre)

No. of boats	Unit fuel use (L)	Unit charge/L	Commission	Remarks	
1,325	120	0.2	31,800	DH/year	(seiner)
10,668	40	0.2	85,344	DH/year	(small boat)
		Total	117,144		

Ice sales

Daily production	Unit price (DH/ton)	No. of days	monthly sale	No. of month	Remarks
4	300	30	36,000	6	high season : April to September
		20	24,000	6	low season : October to March
Ice sales (year)				360,000	DH

Rental

Facility	Unit price (DH/pc.)	Amount	Total
Fishermen locker	50	60	3,000
Workshop	3,000	1	3,000
Shops	50	10	500
G-total			6,500
Rental (year)			78,000

Other income

Facility	Income (month)	Amount	Total
Cantine	3,000	1	3,000
Hamam	3,000	1	3,000
G-total			6,000
Income (year)			72,000

Membership fee

Unit price (DH)	No. of member	Fee	Remarks
500	322	161,000	First year only

Table 5-3-B-23 Financial Analysis - Benefit (Plan-2)

Benefit

1,619,262	DH/Year	
in the First year	161,000	DH added

Fish landing commission

	Landing value(year)	Rate	Commission	Remarks
Fishery Coop.	16,539,305	1%	165,393	DH/year
ONP	16,539,305	5%	826,965	DH/year
Total			992,358	

Commission for fuel sales

(L: litre)

No. of boats	Unit fuel use (L)	Unit charge/L	Commission	Remarks	
1,315	120	0.2	31,560	DH/year	(seiner)
10,668	40	0.2	85,344	DH/year	(small boat)
		Total	116,904		

Ice sales

Daily production	Unit price (DH/ton)	No. of days	monthly sale	No. of month	Remarks
4	300	30	36,000	6	high season : April to September
		20	24,000	6	low season : October to March
Ice sales (year)				360,000	DH

Rental

Facility	Unit price (DH/pc.)	Amount	Total
Fishermen locker	50	60	3,000
Workshop	3,000	1	3,000
Shops	50	10	500
G-total			6,500
Rental (year)			78,000

Other income

Facility	Income (month)	Amount	Total
Cantine	3,000	1	3,000
Hamam	3,000	1	3,000
G-total			6,000
Income (year)			72,000

Membership fee

Unit price (DH)	No. of member	Fee	Remarks
500	322	161,000	First year only

Table 5-3-B-24 Calculation sheet of FIRR (Plan-1)

Financial Internal Rate of Return (FIRR)

Year	Cost	Benefit	Net Cash Flow	Discount Rate 1%	Net Present Value	Discount Rate 3%	Net Present Value
1	67,036,500	0	-67,036,500	0.990	-66,372,772	0.971	-65,083,981
2	637,773	1,786,147	1,148,374	0.980	1,125,746	0.943	1,082,452
3	637,773	1,625,147	987,374	0.971	958,335	0.915	903,587
4	637,773	1,625,147	987,374	0.961	948,847	0.888	877,269
5	637,773	1,625,147	987,374	0.951	939,452	0.863	851,717
6	637,773	1,625,147	987,374	0.942	930,151	0.837	826,910
7	637,773	1,625,147	987,374	0.933	920,941	0.813	802,825
8	637,773	1,625,147	987,374	0.923	911,823	0.789	779,442
9	637,773	1,625,147	987,374	0.914	902,795	0.766	756,740
10	637,773	1,625,147	987,374	0.905	893,857	0.744	734,699
11	637,773	1,625,147	987,374	0.896	885,006	0.722	713,300
12	637,773	1,625,147	987,374	0.887	876,244	0.701	692,524
13	637,773	1,625,147	987,374	0.879	867,568	0.681	672,353
14	637,773	1,625,147	987,374	0.870	858,979	0.661	652,770
15	637,773	1,625,147	987,374	0.861	850,474	0.642	633,758
16	637,773	1,625,147	987,374	0.853	842,053	0.623	615,299
17	637,773	1,625,147	987,374	0.844	833,716	0.605	597,377
18	637,773	1,625,147	987,374	0.836	825,461	0.587	579,978
19	637,773	1,625,147	987,374	0.828	817,289	0.570	563,085
20	637,773	1,625,147	987,374	0.820	809,197	0.554	546,685
21	637,773	1,625,147	987,374	0.811	801,185	0.538	530,762
22	637,773	1,625,147	987,374	0.803	793,252	0.522	515,303
23	637,773	1,625,147	987,374	0.795	785,398	0.507	500,294
24	637,773	1,625,147	987,374	0.788	777,622	0.492	485,722
25	637,773	1,625,147	987,374	0.780	769,923	0.478	471,575
26	637,773	1,625,147	987,374	0.772	762,300	0.464	457,840
27	637,773	1,625,147	987,374	0.764	754,752	0.450	444,505
28	637,773	1,625,147	987,374	0.757	747,280	0.437	431,558
29	637,773	1,625,147	987,374	0.749	739,881	0.424	418,988
30	637,773	1,625,147	987,374	0.742	732,555	0.412	406,785
					-41,710,691		-46,537,878

FIRR	-7.64 %

Impossible to calculate

Table 5-3-B-25 Calculation sheet of FIRR (Plan-2)

Financial Internal Rate of Return (FIRR)

Year	Cost	Benefit	Net Cash Flow	Discount Rate 1%	Net Present Value	Discount Rate 3%	Net Present Value
1	37,111,500	0	-37,111,500	0.990	-36,744,059	0.971	-36,030,583
2	637,773	1,780,262	1,142,489	0.980	1,119,977	0.943	1,076,905
3	637,773	1,619,262	981,489	0.971	952,623	0.915	898,201
4	637,773	1,619,262	981,489	0.961	943,192	0.888	872,040
5	637,773	1,619,262	981,489	0.951	933,853	0.863	846,641
6	637,773	1,619,262	981,489	0.942	924,607	0.837	821,981
7	637,773	1,619,262	981,489	0.933	915,452	0.813	798,040
8	637,773	1,619,262	981,489	0.923	906,389	0.789	774,796
9	637,773	1,619,262	981,489	0.914	897,414	0.766	752,229
10	637,773	1,619,262	981,489	0.905	888,529	0.744	730,320
11	637,773	1,619,262	981,489	0.896	879,732	0.722	709,048
12	637,773	1,619,262	981,489	0.887	871,022	0.701	688,397
13	637,773	1,619,262	981,489	0.879	862,398	0.681	668,346
14	637,773	1,619,262	981,489	0.870	853,859	0.661	648,880
15	637,773	1,619,262	981,489	0.861	845,405	0.642	629,980
16	637,773	1,619,262	981,489	0.853	837,035	0.623	611,631
17	637,773	1,619,262	981,489	0.844	828,747	0.605	593,817
18	637,773	1,619,262	981,489	0.836	820,542	0.587	576,521
19	637,773	1,619,262	981,489	0.828	812,418	0.570	559,729
20	637,773	1,619,262	981,489	0.820	804,374	0.554	543,427
21	637,773	1,619,262	981,489	0.811	796,410	0.538	527,599
22	637,773	1,619,262	981,489	0.803	788,524	0.522	512,232
23	637,773	1,619,262	981,489	0.795	780,717	0.507	497,312
24	637,773	1,619,262	981,489	0.788	772,987	0.492	482,827
25	637,773	1,619,262	981,489	0.780	765,334	0.478	468,765
26	637,773	1,619,262	981,489	0.772	757,756	0.464	455,111
27	637,773	1,619,262	981,489	0.764	750,254	0.450	441,856
28	637,773	1,619,262	981,489	0.757	742,826	0.437	428,986
29	637,773	1,619,262	981,489	0.749	735,471	0.424	416,491
30	637,773	1,619,262	981,489	0.742	728,189	0.412	404,360
					-12,228,024		-17,594,111

FIRR	-1.28 %

Impossible to calculate

Table 5-3-B-26 Economic Analysis-Cost (Plan-1) (i)

Economic Analysis
Capital Expenditure (CAPEX)

Area	Facility	Scale	Unit	Unit price (DH)	Market price	Convers'n factor	Shadow price
Port facilities					45,250,000		40,785,000
	North breakwater	200	m	125,000	25,000,000	0.9	22,500,000
	South breakwater	50	m	83,333	4,166,667	0.9	3,750,000
	Revetment	250	m	25,000	6,250,000	0.9	5,625,000
	Wharf (-1.5m)	50	m	25,000	1,250,000	0.9	1,125,000
	Slipway	50	m	33,333	1,666,667	0.9	1,500,000
	Navigation aids	2	set	125,000	250,000	1.14	285,000
	Land	80,000	m3	83	6,666,667	0.9	6,000,000
Port service					16,154,167		15,418,875
facilities	Fish market	200	m2	5,833	1,166,667	0.89	1,038,333
	Ice & preservation	100	m2	5,833	583,333	0.89	519,167
	Fisheries center	430	m2	5,833	2,508,333	0.89	2,232,417
	Workshop	40	m2	4,167	166,667	0.89	148,333
	Fishermen's locker	925	m2	4,167	3,854,167	0.89	3,430,208
	Warehouse	20	m2	4,167	83,333	0.89	74,167
	Fisheries support shop	50	m2	5,833	291,667	0.89	259,583
	Drainage treatment	1	set	833,333	833,333	1.14	950,000
	Ice making plant	1	set	2,083,333	2,083,333	1.14	2,375,000
	Chilled room	1	set	1,250,000	1,250,000	1.14	1,425,000
	Connect'n&insite road	500	m	3,333	1,666,667	0.89	1,483,333
	External work	1	set	1,666,667	1,666,667	0.89	1,483,333
Equipment					666,667		760,000
	Fish handling	1	set	416,667	416,667	1.14	475,000
	Workshop	1	set	250,000	250,000	1.14	285,000
Consulting fee		1	set	4,965,667	4,965,667	1.00	4,965,667
Total					67,036,500		61,929,542

Table 5-3-B-27 Economic Analysis - Cost (Plan-2) (i)

Economic Analysis
Capital Expenditure (CAPEX)

Area	Facility	Scale	Unit	Unit price (DH)	Market price	Convers'n factor	Shadow price
Port facilities					17,541,667		15,817,500
	Groin	200	m	41,667	8,333,333	0.9	7,500,000
	Revetment	50	m	25,000	1,250,000	0.9	1,125,000
	Slipway	80	m	66,667	5,333,333	0.9	4,800,000
	Navigation aids	1	set	125,000	125,000	1.14	142,500
	Land	30,000	m3	83	2,500,000	0.9	2,250,000
Port service					16,154,167		15,418,875
facilities	Fish market	200	m2	5,833	1,166,667	0.89	1,038,333
	Ice & preservation	100	m2	5,833	583,333	0.89	519,167
	Fisheries center	430	m2	5,833	2,508,333	0.89	2,232,417
	Workshop	40	m2	4,167	166,667	0.89	148,333
	Fishermen's locker	925	m2	4,167	3,854,167	0.89	3,430,208
	Warehouse	20	m2	4,167	83,333	0.89	74,167
	Fisheries support shop	50	m2	5,833	291,667	0.89	259,583
	Drainage treatment	1	set	833,333	833,333	1.14	950,000
	Ice making plant	1	set	2,083,333	2,083,333	1.14	2,375,000
	Chilled room	1	set	1,250,000	1,250,000	1.14	1,425,000
	Connect'n&insite road	500	m	3,333	1,666,667	0.89	1,483,333
	External work	1	set	1,666,667	1,666,667	0.89	1,483,333
Equipment					666,667		760,000
	Fish handling	1	set	416,667	416,667	1.14	475,000
	Workshop	1	set	250,000	250,000	1.14	285,000
Consulting fee		1	set	2,749,000	2,749,000	1.00	2,749,000
Total					37,111,500		34,745,375

Table 5-3-B-26 Economic Analysis - Cost (Plan-1) (ii)

Operation Expenditure (OPEX) 568,745 DH/Year

Personnel Cost

Area	Title	Unit Price(DH)	No. of person	Cost (Month)	Convers'n factor	Shadow price
Administration	Manager	2,500	1	2,500	1.0	2,500
	Accountant	2,500	1	2,500	1.0	2,500
	Secretary	1,300	1	1,300	1.0	1,300
Ice machine	Engineer	2,700	1	2,700	1.0	2,700
	General worker	1,200	1	1,200	0.5	600
Workshop	Engineer	2,000	1	2,000	1.0	2,000
	Carpenter	1,400	1	1,400	1.0	1,400
Cantine	Cook	1,300	1	1,300	1.0	1,300
	Server	500	1	500	0.5	250
Hamam	Worker	1,200	1	1,200	1.0	1,200
Fuel Station	Worker	1,200	1	1,200	0.5	600
Others	Security men	1,200	2	2,400	0.5	1,200
Fish Market	Manager	2,500	1	2,500	1.0	2,500
	General worker	1,200	1	1,200	0.5	600
Total (month)				23,900		20,650
Total (year)				286,800		247,800

Cost of utility

Item	Use	Consumption	Unit price	Price (DH)	Transfer item	Shadow price	Remarks
Electricity	Ice machine	35	291	10,185	713	9,472	base charge (year)
		20,160	0.99	20,051	1,404	18,647	monthly use
	Refrigerator	216	1.27	274	19	255	monthly price
	Lights and others	768	1.30	998	70	929	monthly price
Total (year)				266,066		247,442	
Item	Use	Consumption	Unit price	Price (DH)	Transfer item	Shadow price	Remarks
Water	Fish market	100	5.83	583	41	542	monthly price
	Ice machine	180	5.83	1,049	73	976	monthly price
	Others	40	5.83	233	16	217	monthly price
Total (year)				22,387		20,820	

Maintenance and Operation Cost

facility	Cost (month)	Remarks	Transfer item	Shadow price			
Workshop	500		100	400			
Hamam	1,710	fuel cost	120	1,590	break down	daily consumpt'n	15
Ice machine	500		100	400		unit price	3.8
Building	500		100	400		no. of days	30
Other expenses	2,000	vehicles etc.	400	1,600			
Total	5,210			4,390			
Cost (year)	62,520			52,684			

Transfer item means the VAT (Value Added Tax). Their tax rate are	
fuel, light	7 %
other commodities	20 %

Table 5-3-B-27 Economic Analysis - Cost (Plan-2) (ii)

Operation Expenditure (OPEX) 568,745 DH/Year

Personnel Cost

Area	Title	Unit Price(DH)	No. of person	Cost (Month)	Convers'n factor	Shadow wage
Administration	Manager	2,500	1	2,500	1.0	2,500
	Accountant	2,500	1	2,500	1.0	2,500
	Secretary	1,300	1	1,300	1.0	1,300
Ice machine	Engineer	2,700	1	2,700	1.0	2,700
	General worker	1,200	1	1,200	0.5	600
Workshop	Engineer	2,000	1	2,000	1.0	2,000
	Carpenter	1,400	1	1,400	1.0	1,400
Cantine	Cook	1,300	1	1,300	1.0	1,300
	Server	500	1	500	0.5	250
Hamam	Worker	1,200	1	1,200	1.0	1,200
Fuel Station	Worker	1,200	1	1,200	0.5	600
Others	Security men	1,200	2	2,400	0.5	1,200
Fish Market	Manager	2,500	1	2,500	1.0	2,500
	General worker	1,200	1	1,200	0.5	600
Total (month)				23,900		20,650
Total (year)				286,800		247,800

Cost of utility

Item	Use	Consumption	Unit price	Price (DH)	Transfer item	Shadow price	Remarks
Electricity	Ice machine	35	291	10,185	713	9,472	base charge (year)
		20,160	0.99	20,051	1,404	18,647	monthly use
	Refrigerator	216	1.27	274	19	255	monthly price
	Lights and others	768	1.30	998	70	929	monthly price
Total (year)				266,066		247,442	
Item	Use	Consumption	Unit price	Price (DH)	Transfer item	Shadow price	Remarks
Water	Fish market	100	5.83	583	41	542	monthly price
	Ice machine	180	5.83	1,049	73	976	monthly price
	Others	40	5.83	233	16	217	monthly price
Total (year)				22,387		20,820	

Maintenance and Operation Cost

facility	Cost (month)	Remarks	Transfer item	Shadow price
Workshop	500		100	400
Hamam	1,710	fuel cost	120	1,590
Ice machine	500		100	400
Building	500		100	400
Other expenses	2,000	vehicles etc.	400	1,600
Total	5,210			4,390
Cost (year)	62,520			52,684

break down	
daily consumpt'n	15
unit price	3.8
no. of days	30

Transfer item means the VAT (Value Added Tax). Their tax rate are

fuel, light	7 %
other commodities	20 %

Table 5-3-B-28 Economic Analysis - Benefit (Plan-1)

Benefit: 2,096,924 DH/Year

	without Project		with Project		Surplus production	Surplus value	Consumer's surplus Shadow price
	Landed quantity	Landing value	Landed quantity	Landing value			
Total Landing	1,442,378	15,244,291	1,528,996	16,633,385	86,618	1,389,095	
To export						416,728	570,084
To domestic						972,366	1,166,839

Increase of landing	Increase of export	Increase of domestic supply
1,736,924	570,084	1,166,839

Rate of increase of landed quantity	6.9	% (seiner)
Rate of increase of landed quantity	1.1	% (small boat)
Rate of increase of fish price	5	%
Percentage of export oriented	30	%
Percentage of domestic oriented	70	%
Domestic marketing factor	1.20	
Shadow exchange rate	1.14	

Note 1:
With the construction of fish market, more competitive price will be realized through the auction among meddle men.
With the construction of refrigerator, quality down caused by the absence of refrigerator, will be controlled.
As a result, fish price is expected to increase as left
(based on the interview survey at site)

Note 2:
Product is exported from Port of Nador
Product is consumed at the market of Nador

Ice sales

Daily production	Unit price (DH/ton)	No. of days	monthly sale	No. of month	Remarks
4	300	30	36,000	6	high season : April to September
		20	24,000	6	low season : October to March
Ice sales (year)				360,000	DH

Table 5-3-B-29 Economic Analysis - Benefit

Benefit 1,979,286 DH

	without Project		with Project		Surplus production	Surplus value	Consumer's surplus Shadow price
	Landed quantity	Landing value	Landed quantity	Landing value			
Total Landing	1,442,378	15,244,291	1,514,996	16,539,305	72,618	1,295,015	
To export						388,504	531,474
To domestic						906,510	1,087,812

Increase of landing	Increase of export	Increase of domestic supply
1,619,286	531,474	1,087,812

Rate of increase of landed quantity	5.8	% (seiner)
Rate of increase of landed quantity	1.1	% (small boat)
Rate of increase of fish price	5	%
Percentage of export oriented	30	%
Percentage of domestic oriented	70	%
Domestic marketing factor	1.20	
Shadow exchange rate	1.14	

Note 1:
With the construction of fish market, more competitive price will be realized through the auction among meddle men.
With the construction of refrigerator, quality down caused by the absence of refrigerator, will be controlled.
As a result, fish price is expected to increase as left (based on the interview survey at site)

Note 2:
Product is exported from Port of Nador
Product is consumed at the market of Nador

Ice sales

Daily production	Unit price (DH/ton)	No. of days	monthly sale	No. of month	Remarks
4	300	30	36,000	6	high season : April to September
		20	24,000	6	low season : October to March
Ice sales (year)				360,000	DH

Table 5-3-B-30 Calculation sheet of EIRR (Plan-1)

Economic Internal Rate of Return

Year	Cost	Benefit	Net Cash Flow	Discount Rate 1%	Net Present Value	Discount Rate 2%	Net Present Value
1	61,929,542	0	-61,929,542	0.990	-61,316,378	0.980	-60,715,237
2	568,745	2,096,924	1,528,179	0.980	1,498,067	0.961	1,468,838
3	568,745	2,096,924	1,528,179	0.971	1,483,235	0.942	1,440,037
4	568,745	2,096,924	1,528,179	0.961	1,468,550	0.924	1,411,801
5	568,745	2,096,924	1,528,179	0.951	1,454,009	0.906	1,384,118
6	568,745	2,096,924	1,528,179	0.942	1,439,613	0.888	1,356,979
7	568,745	2,096,924	1,528,179	0.933	1,425,360	0.871	1,330,371
8	568,745	2,096,924	1,528,179	0.923	1,411,247	0.853	1,304,286
9	568,745	2,096,924	1,528,179	0.914	1,397,275	0.837	1,278,711
10	568,745	2,096,924	1,528,179	0.905	1,383,440	0.820	1,253,639
11	568,745	2,096,924	1,528,179	0.896	1,369,743	0.804	1,229,058
12	568,745	2,096,924	1,528,179	0.887	1,356,181	0.788	1,204,958
13	568,745	2,096,924	1,528,179	0.879	1,342,753	0.773	1,181,332
14	568,745	2,096,924	1,528,179	0.870	1,329,459	0.758	1,158,168
15	568,745	2,096,924	1,528,179	0.861	1,316,296	0.743	1,135,459
16	568,745	2,096,924	1,528,179	0.853	1,303,263	0.728	1,113,195
17	568,745	2,096,924	1,528,179	0.844	1,290,360	0.714	1,091,368
18	568,745	2,096,924	1,528,179	0.836	1,277,584	0.700	1,069,969
19	568,745	2,096,924	1,528,179	0.828	1,264,934	0.686	1,048,989
20	568,745	2,096,924	1,528,179	0.820	1,252,410	0.673	1,028,420
21	568,745	2,096,924	1,528,179	0.811	1,240,010	0.660	1,008,255
22	568,745	2,096,924	1,528,179	0.803	1,227,733	0.647	988,486
23	568,745	2,096,924	1,528,179	0.795	1,215,577	0.634	969,103
24	568,745	2,096,924	1,528,179	0.788	1,203,542	0.622	950,101
25	568,745	2,096,924	1,528,179	0.780	1,191,625	0.610	931,472
26	568,745	2,096,924	1,528,179	0.772	1,179,827	0.598	913,208
27	568,745	2,096,924	1,528,179	0.764	1,168,146	0.586	895,302
28	568,745	2,096,924	1,528,179	0.757	1,156,580	0.574	877,747
29	568,745	2,096,924	1,528,179	0.749	1,145,129	0.563	860,536
30	568,745	2,096,924	1,528,179	0.742	1,133,791	0.552	843,663
					-23,390,640		-27,937,668

EIRR	-4.09 %

Impossible to calculate

Table 5-3-B-31 Calculation sheet of EIRR

Economic Internal Rate of Return

Year	Cost	Benefit	Net Cash Flow	Discount Rate 1%	Net Present Value	Discount Rate 2%	Net Present Value
1	34,745,375	0	-34,745,375	0.990	-34,401,361	0.980	-34,064,093
2	568,745	1,979,286	1,410,541	0.980	1,382,748	0.961	1,355,768
3	568,745	1,979,286	1,410,541	0.971	1,369,057	0.942	1,329,184
4	568,745	1,979,286	1,410,541	0.961	1,355,502	0.924	1,303,122
5	568,745	1,979,286	1,410,541	0.951	1,342,081	0.906	1,277,570
6	568,745	1,979,286	1,410,541	0.942	1,328,793	0.888	1,252,520
7	568,745	1,979,286	1,410,541	0.933	1,315,637	0.871	1,227,961
8	568,745	1,979,286	1,410,541	0.923	1,302,611	0.853	1,203,883
9	568,745	1,979,286	1,410,541	0.914	1,289,714	0.837	1,180,278
10	568,745	1,979,286	1,410,541	0.905	1,276,944	0.820	1,157,135
11	568,745	1,979,286	1,410,541	0.896	1,264,301	0.804	1,134,446
12	568,745	1,979,286	1,410,541	0.887	1,251,783	0.788	1,112,202
13	568,745	1,979,286	1,410,541	0.879	1,239,390	0.773	1,090,394
14	568,745	1,979,286	1,410,541	0.870	1,227,118	0.758	1,069,014
15	568,745	1,979,286	1,410,541	0.861	1,214,969	0.743	1,048,053
16	568,745	1,979,286	1,410,541	0.853	1,202,939	0.728	1,027,503
17	568,745	1,979,286	1,410,541	0.844	1,191,029	0.714	1,007,356
18	568,745	1,979,286	1,410,541	0.836	1,179,237	0.700	987,603
19	568,745	1,979,286	1,410,541	0.828	1,167,561	0.686	968,239
20	568,745	1,979,286	1,410,541	0.820	1,156,001	0.673	949,254
21	568,745	1,979,286	1,410,541	0.811	1,144,555	0.660	930,641
22	568,745	1,979,286	1,410,541	0.803	1,133,223	0.647	912,393
23	568,745	1,979,286	1,410,541	0.795	1,122,003	0.634	894,503
24	568,745	1,979,286	1,410,541	0.788	1,110,894	0.622	876,964
25	568,745	1,979,286	1,410,541	0.780	1,099,895	0.610	859,768
26	568,745	1,979,286	1,410,541	0.772	1,089,005	0.598	842,910
27	568,745	1,979,286	1,410,541	0.764	1,078,223	0.586	826,382
28	568,745	1,979,286	1,410,541	0.757	1,067,548	0.574	810,179
29	568,745	1,979,286	1,410,541	0.749	1,056,978	0.563	794,293
30	568,745	1,979,286	1,410,541	0.742	1,046,513	0.552	778,719
					604,892		-3,855,360

EIRR	1.14 %