2. KAYAR PROJECT

2. Kayar Project

2.1 Sector 1: Fish Resources and Production

2.1.1 Projection

(1) Projection of Fish Production in the Study Area

Basic consideration

Fishery production is influenced and restricted by the abundance of resources. In this study, two scenarios in the production target for each group of fishes were determined on the basis of the exploitability of the resources available; the first scenario considered the available resources, and the second scenario is based on the increase fishermen population (Table III.2.1-1). The following assumptions were used in the projection of fish production.

1) Base value (1995): The figures of fisheries data of 1995 according to the Annual Fisheries Statistics of DOPM were used as base values.

2) Sardinelle group: Exploitation of the resource has reached near to the maximum level. The production is projected to be 10,200 tons based on the highest production in the past (1992), because a long-term assessment is difficult due to the great fluctuations of biomass in pelagic group which are influenced by oceanographic and meteorological conditions.

3) High-price fish group

Case 1 - The resources are in a state of full- or over exploitation. Hence, the production will remain at a level similar to that in 1995, assuming no resources management measures are taken. The projected production for 2010 will be 2,435 tons.

Case 2: Within the 20 nautical mile limit, the production will maintain at the current level by resource management. Off Kayar, the ocean floor deepens steeply to 200 m within the 20 nautical mile limit. The exploitation of the resources in such a deep water in this zone is not expected. The existing offshore fishing in long distance fishing grounds as far as Guinea sea will continue. This project should not promote increase of fishing effort in foreign waters; however, an increase of 20 tons is considered a minimum level of production from these resources using the modernized boats in the pilot project.

4) Other fish group

Case 1: In the case of the other fish group, if no improvement is achieved in productivity and profitability, fishing efforts will not increase. Production of this group as a by-catch in other fisheries will not also increase. Therefore, the projected production will remain at the base value.

Case 2: Among the coastal demersal fish species, some are considered to have potential for further exploitation.. In the case where improvement is achieved in productivity and profitability, fishing efforts will increase. The resources are expected to allow an increase of 20 percent of base value, therefore, the production in 2010 is estimated at 6,500 tons.

Comparison of projection of fish production by case

Unit: tons

	Base value	Case 1	Case 2
Sardinelle group	9,018	10,200	10,200
High-price fish group	2,435	2,435	2,600
Other fish group	5,445	5,445	6,500
Total	16,898	18,080	19,300

Projection of fish production in case 2 (adopted by project)

Unit: tons

	Base value	2000	2005	2010
Sardinelle group	9,018	9,400	9,800	10,200
High-price fish group	2,435	2,500	2,550	2,600
Other fish group	5,445	5,800	6,100	6,500
Total	16,898	17,700	18,450	19,300

(2) Projection of the Number of Fishing Boats

1) Purse seine boat

The projected production in 2010 is an increase of only about 10 percent of the present level. Based on the present figure of productivity in the purse seine fishery of 738 ton/unit/year, the number of purse seine boats in 2010 is projected to be 14 pairs (28 boats) which is an increase by two pairs from the present figure.

2) Day fishing boat (line and gill net)

For day fishing of high-price fish, fishery management will be strengthened and the number of boats will be maintained at the present level, in order to conserve

the resources and protect the profitability of the fishery.

In order to attain the projected production target of 1,000 tons for the other fish group, the number of fishing boats should be increased. This increase will be achieved by the increase of gill net fishing boats. The average income of the gill net fishery is currently 6.9 million FCFA/boat/year, which is an equivalent of about 53 tons of fish in the other fish group. However, a considerable portion of the catch of these boats is composed of high-price fish, and hence the actual catch is much less than 53 tons. The improvement of the productivity through the modernization of fishing boats is necessary to maintain the 53-ton level mainly for fishes of the other fish group. In order for the fishing boats to achieve this level of catch, an increase of 25 gill net fishing boats is necessary to attain the production target.

3) Long-distance fishing boat (line fishing)

The number of fishing boats necessary to attain the projected production increase of 200 tons is estimated as follows. The productivity of this fishery is assumed to be 20 tons/unit/year, a which is a figure already verified in the Missirah Project. About 10 modernized line fishing boats are proposed in this project. Fishing ground considered for these boats is the same as that being used by the boats in the Missirah Project.

Projection of number of fishing boat in case 2 (adopted by project)

	Base value	2000	2005	2010
Purse seine boats	24	25	26	28
Line fishing boats	393	393	393	393
Gill net fishing boats	33	40	47	53
Long distance fishing boats	2	5	9	12
Total	452	463	475	486

Projection of number of fishermen in case 2 (adopted by project)

	Base value	2000	2005	2010
Purse seine boats	480	500	520	560
Line fishing boats	1,179	1,179	1,179	1,179
Gill net fishing boats	165	200	235	265
Long distance fishing boats	30	75	135	150
Total	1,854	1,954	2,069	2,184

2.1.2 Development Goals and Concept

(1) Development Goals

- Increase fish production through the introduction of effective resources management system and modernization of fishing technologies
- Improve safety conditions of fishermen at the fish landing point
- Transfer landing activities from the current sites to the proposed fishing complex

(2) Development Concept

Fishing Modernization

Gradual modernization of fishing technologies will be applied for fisheries development in Kayar. Initial investment for short term target year should be at a level of pilot scale.

a. Coastal fishing (within 20 nautical miles from Kayar): to maintain the existing level of production for high-price fish group through introduction of efficient fishing technologies considering resources protection. Increase of production will focus on the groups of some other fish species.

b. Off-shore fishing (outside of 20 nautical miles) : to develop offshore fishing through the introduction of modernized fishing boats, engines and gears.

Safety control

Safety control service will be attractive measure for the fishermen to use the fisheries complex. Security conditions will be improved by training, strengthening of the PSPS function and fishermen's support infrastructure such as lighthouse.

Fishermen support facilities

Workshop, fishing gears and shipyard will contribute to the centralization of fish landing activities from the existing landing sites to the complex in the short term. These facilities and equipment will serve the selected fishermen who have a willingness and good experience in fishing.

2.1.3 Fish Resource Management

Resources management will focus on control and monitoring. It is important to establish trust and cooperation with fishermen's leaders and organization to promote-community based rational management.

(1) Research Post

The research post will provide limited function and is expected to produce reliable fisheries data and information. It is not necessary to set up research facility and to train front line staff in research and statistics, which should be left to the technicians in CRODT in Dakar.

(2) DOPM

For effective resources management, improvement of data base of fishermen, fishing boat registration and fish landing is an urgent issue. The minimum equipment such as computer and software, and staff training on fishery statistics will be required in the project. The first priority for data base will be given for the line fishing and sole gill net fishing which exploit high-price fish resources, i.e. dorade, pageot, sole, thiof etc. within the 20 nautical miles zone.

(3) Fishing Control and Monitoring

The objective of this function is to introduce a system for the appropriate self-management of resources. "Community management" should involve collective responsibility as well as creation of some forms of regulation of fishing activities such as a system of individual fishing quotas arrangement such as already introduced in Kayar. The project will promote a community-based management through establishing a "community management guideline" and strengthen the management capacity of present organization i.e. CNPS and coordination committee through training.

Summary of project facility and equipment

Item/purpose	Quantity	Location
Office & wet laboratory - Strengthening of CRODT	1 200m^2	F/C (CRODT)
Motor cycle - Strengthening of monitoring/control surveillance	2	F/C
Computer & software - Research & data base	2	F/C
Laboratory equipment - Stock assessment	Nil	F/C
Oceanographic equipment - Stock assessment	Nil	F/C

2.1.4 Fish Production

The main constraint of this sector is the limitation of production potential in the coastal zone, despite the rapid increase of fish demand caused by the population increase. There may be a need for some limitation of fishing effort in this zone in the near future, in order to maintain sustainable productivity. In the project, fisheries with

exploitable resources potentials will be considered for artisanal fishermen, that is fishing of some other fish group in the offshore and coastal waters.

Priority will be on modernizing line and gillnet fishing. An expansion of purse seine is not a core component of the project because further development of purse seine fishing in offshore zone largely depends on industrialization of the boat and its market price. It is considered that industrialization is still too drastic a measure in terms of changes of boat and techniques, and poor existing fishing infrastructure. However, experimental operations and feasibility studies of industrialized boat should be undertaken in the project using demonstration boat.

The past experience in the modernization project indicates the importance of the institutional development of the implementation body as well as effective training of fishermen. In the project, modern equipment newly introduced will be provided for fishermen after selection of the model fishermen for fisheries modernization through evaluation of training result. Equipment will also be provided to fishermen for on-the-job training and under lease contract to ensure the sustainable operation and management.

(1) Modernization of Coastal Fisheries (existing fishing zone)

Production increase of other fish group

The proposed project will take initiatives to increase production of other fish (including some high-price fish) in Kayar by 1,000 tons in the year 2010. Increase of production will be in brotula, cuttlefish, sharks, rays etc. through the enhancement of mainly gill net fishery.

The project will promote efficient operation by introduction of modern equipment, such as echo-sounder, GPS which contribute to locate good fishing ground, and increase the fishing effort per boat. These equipment and some training services will be prepared for 20 fishing boat which is the minimum number to attain the target production at 2010. In the initial stage, experimental fishing is required to decide fishing gear design and fishing operation schedule for fishermen to realize the economically optimum combination of the target species among the low-price other fish and high-price fish, especially cuttle fish which allows further exploitation. Information about fishing grounds and water currents gathered by the experimental fishing undertaken by project will be available to the fishermen.

Improvement of productivity

Not much production increase of high price fish is expected in this zone. The modernization is regarded as a tool for promoting organization of fishermen to

transfer technologies to fishermen on resources management, safety control, marketing, credit, etc. as well as a tool for production enhancement. Introduction of modern equipment such as echo-sounder, compass and GPS will increase productivity through strengthening fishing operation and reducing fish searching time. The present active operational hour of day fishing is expected to increase from 5 hours to 6 hours.

In the project, echo-sounders, compasses and GPSs will be provided under lease contract for the existing traditional boats. Project will also procure these items through CAEP, and they will be sold to groups of fishermen who can obtain credit under the project. The project will provide 30 echo-sounders and compasses and 10 GPS as experimental basis. This equipment will account for 5 percent of target number in 2010.

(2) Modernization of Long Distance Fishing Vessel

The proposed project will take initiatives to promote replacement of traditional boat with modern vessel.

The project will introduce model boats, i.e. fully equipped Senegalese-type FRP canoe, 18m in length, powered with an inboard diesel engine of 40 HP. Such boats have been proven to be economical, particularly in fuel consumption, through the Missrah Project. Better stability of FRP boat will also allow the fishermen to considerably increase the number of fishing days.

The mid-term aim of the project is the replacement of the existing boats equipped with out-board gasoline engines with boat installed with inboard diesel engines. The new boats can be produced in Senegal and/or neighboring African countries, in view of the existence of two private firms in Dakar and several in Mauritania supplying FRP and aluminum boats. Structures and design of boats and economic performance should be evaluated during the initial two years of the project through technical cooperation of foreign experts.

(3) Demonstration Vessel

Provision of demonstration vessel will greatly expedite artisanal fisheries development, through conducting the following activities.

- Establish and develop modern technology for artisanal fisheries in the northern coast and promote the spread of proven technology. Example: light fishing, long line, deep sea fishing, purse seine, trammel net, etc.
- Develop new fishing grounds and draw up fishing ground maps especially in off-shore zone
- Train artisanal fishermen in the operation of semi-industrial boat

- Train artisanal fishermen in safety control

Summary of fish production facility and equipment

Item	Quantity	Location
1) Demonstration vessel (fully equipped). - Inboard engine, FRP, Japanese type, gillnet, line, purse seine - For training & experimental operation	1	Fishery complex (DOPM)
2) Fishing boat, inboard engine, Senegalese type, equipped with gear & echo-sounder, GPS - For OJT and rental to fishermen	10	Model-fishermen
3) Echo-sounder/compass - For OJT and rental to fishermen	30	-ditto-
4) Global Positioning System (GPS) - For OJT and rental to fishermen	10	-ditto-

2.1.5 Fisheries Support Facility

(1) Fishing Gear Storage

The main equipment to be stored is the out-board engine. A storage should be provided in the fishery complex near the landing place to store engines, nets and other tools with a net repair space beside the storage. In comparison to Saint Louis where number of fishermen may keep their engine and gears at fisheries complex and at their homes, in Kayar most of fishermen can store them in their houses. However, storage space should be provided for all purse seine fishing units because of their large quantity of gears, such as engines, nets, etc., and for 10 percent of the total units of line and gill net fisheries. The storage should contain 20 large-size compartments ($12m^2$ each) and 60 small-size compartment ($6m^2$ each) for other fishing units.

(2) Boatyard

Boatyard for repairing, overhauling and constructing new fishing boats are indispensable facilities for the sound implementation of the project. Boatyard will provide the following services.

- Maintenance of boats and engines
- Studies of the structure of long distance fishing boats.
- tTaining and demonstration for local boat builder in modern boat building technology
- Safety inspection of fishing boat

(3) Fuel Station

Introduction of in-board engine will not be successful without providing easy access to tax free diesel fuel, which is available at present only in Dakar. Once the fisheries complex comes into operation, the complex will be required to transport

diesel fuel from Dakar and supply it for fishermen. The sales of the fuel will be done by private fuel stations, for which the project should provide land spaces. Considering the expected increase in number of long-distance fishing boats and the expected transfer of landing function for purse seine fishery from the existing landing places to fisheries complex, it is anticipated that 200,000 liters of diesel fuel is annually required at the fisheries complex.

Summary of fisheries support facility and equipment

Item	Quantity	Location
1) Service apron	1	
2) Office and workshop, including tools and spare parts for inboard engine	1	Fisheries Complex (FC)
3) Private workshop	3	FC
4) Fishing gear storage		
- Large (3x4m) for purse seine fishermen	L:20	FC
- Small 2x3m) for others	S:60	
5) Fuel station	2	FC
- Only space for private fuel station		
6) Slipway and boatyard	1	FC
- For large and project boat		
- 3 private boatbuilder's space		
7) Multi-purpose space	1,000m^2	FC
- Maintenance of net & fishing gears		

2.1.6 Safety Control

The project will provide a lighting system at the fisheries complex for safe landing of boats at night. Capacity building of PSPS should be promoted for the information services by improvement of facility/equipment as well as by staff training. Support to fishermen will put emphasis on essential safe operation and OJT will be conducted for model fishermen who will be provided with essential safety equipment on board.

Summary of safety control facility and equipment

Item	Quantity	Location
1) Office and communication equipment	1	Fisheries Complex (FC)
- Strengthening of PSPS, (existing equipment to be used)	200m^2	(PSPS)
2) Light house	1	FC
3) Search light, speaker	1	FC
4) Life jacket/essential equipment	100	Project boat
- For training and fixed to project boat		FC

2.1.7 Training

The program proposed here is same as that in Saint Louis Project.

2.1.8 Institution and Organization

(1) Staffing

1) Fisheries Complex (autonomous body)

Title	Qualification	Number ES	Number W/P	Task/Role	Source
Professional staff					
- Chief of division	B.Sc.	0	1	- Coordination	DOPM
- Extension staff	B.Sc.	0	1	- Modernization of fishing and safety control	DOPM
- Mechanic	Fishery school	0	1	- Work shop	CAEP
- Boatbuilding technician	Fishery school	0	1	- Boatyard	CAEP
Support staff					Contract
Boat crew		0	3	- Demonstration boat	
Watchmen		0	2	- Workshop and shipyard	
Total		0	8		

2) DOPM					
Professional Staff					
- Regional director	B.Sc.	1	1		DOPM
- Technical staff	fishery school	2			
Total		3	1		

3) CAEP					
Professional staff					
- Mechanics	fishery school	12*	0		
- Accountant		0	1		
- Store keeper	fishery school	0	1	sales of spare parts & equipment	
Total		12	2		

Remarks: * includes mechanics from private sector.

4) PSPS					
professional staff					
- Technical staff	fishery school	3	3		
Total		3	3		

Remarks : ES = Existing staff, and W/P = with the project

Title	Qualification	Number		Task/Role	Source
		ES	W/P		
5) CRODT					
Professional staff					
- Researcher	B.Sc.		1		CRODT new
- Assistant researcher	B.Sc.		1		CRODT new
Support Staff					
- Interviewer	Secondary	2	2		
- Assistant	school	2	2		
Total		4	6		

Remarks : ES = Existing staff, and W/P = with the project

(2) Technical assistance: Kayar

The program proposed here is same as that in the Saint Louis Project.

Table III.2.1-1 Projection of Fishermen Population and Fish Production

1. Population and Fishing Boat						
Year	1995			2010		
	Tradition	New Devel.	Total	Tradition	New Devel.	Total
1.1 Total Population						
Annual average	8,500	3,264	11,764	11,474	6,831	18,305
Peak month (Feb.)	8,500	5,953	14,453	11,474	9,520	20,994
Lean month (Jul)	8,500	878	9,378	11,474	4,445	15,919
1.2 Number of Fishermen (active)						
Annual average	871	960	1,831	1,176	1,798	2,974
Peak month (Feb.)	996	1,751	2,747	1,345	2,659	4,004
Lean month (Jul)	658	258	916	888	951	1,839
Annual average						
	No. of fishermen/boat			Ratio of fihsermen by boat category		
Line	679	501	1,180	917	858	1,775
Gill net	1	161	162	2	336	338
Purse seine	191	298	489	258	603	861
Total	871	960	1,831	1,177	1,797	2,974
Peak season average						
	No. of fishermen/boat			Ratio of fihsermen by boat category		
Line	797	887	1,684	1,076	1,306	2,382
Gill net	3	228	231	4	403	407
Purse seine	196	636	832	265	950	1,215
Total	996	1,751	2,747	1,345	2,659	4,004
Lean season average						
	No. of fishermen/boat			Ratio of fihsermen by boat category		
Line	498	154	652	672	416	1,088
Gill net	-	91	91	-	266	266
Purse seine	160	13	173	216	269	485
Total	658	258	916	888	951	1,839
1.3 No. of wholesalers	27	33	60	33	49	82
1.4 No. of processor	150	90	240	200	185	385
1.5 No. of fishing boats						
(1) Annual average						
Line	226	167	393	306	286	592
Gill net	-	32	32	-	67	67
Purse seine	10	15	25	13	30	43
Total	236	214	450	319	383	702
(2) Peak season,average of January to May						
Line	266	296	562	359	435	794
Gill net	1	46	47	1	81	82
Purse seine	10	32	42	13	47	60
Total	277	374	651	373	563	936
(2) Lean season,average of July to December						
Line	166	51	217	224	139	363
Gill net	-	18	18	-	53	53
Purse seine	8	1	9	11	13	24
Total	174	70	244	235	205	440
2. Fish Landing						
Sarnelles	3,524	5,494	9,018	3,903	7,949	11,852
High-priced fish	1,296	1,139	2,435	1,752	1,791	3,543
Other fish	2,897	2,548	5,445	3,892	4,103	7,995
Total	7,717	9,181	16,898	9,547	13,843	23,390

Source : Resultats Generaux de la Pêche Maritime Senegalaise, DOPM, 1995

2.2 Sector 2 : Fish Marketing and Distribution

2.2.1 Existing Conditions and Future Prospects

(1) Landing and Marketing condition

In comparison to Saint Louis, Kayar fishing village has a Center de Mareyage de Kayar, however its function is limited to sales of ice and fish storage, and no wholesale activities take place at this centre. This village is composed of migrants and resident fishermen who have organized themselves to two separate groups and living in harmony without social conflicts in their fishing and marketing activities. Although the fish landing is scattered, the marketing activities of each group are organized in its own way; from landing, negotiation and purchasing conducted on the beach. The fish transferred to trucks and collection points by human carriers. Icing, packing and loading on to trucks are conducted in a narrow, crowded and congested area (decentralized manner). The whole process takes place in a very congested and unhygienic conditions without any marketing facilities. Wholesalers wait for the arrival of boats in temporary shacks and sheds from early morning to evening. Fish trucks wait along the public roads causing nuisance to the public.

The fish marketing pattern and distribution volume of Kayar in 1995 is shown in Fig. III.2.2-1 and Fig. 111.2.2-2, where a total volume of 16,898 tons of fish were landed by 1,854 fishermen, and marketed by 83 wholesalers and an unknown number of micro-wholesalers in the resident and migrant villages. There were also 385 artisanal processors.

Under these circumstances, there is a need to centralize the marketing activities in the migrant and resident villages (i.e. from landing to marketing in the production area) through the establishment of the marketing facilities such as market hall, ice plant and cold storage, truck berth, etc. Marketing regulations are needed for smooth operation and management and use of the facilities and equipment.

(2) Ice Demand and Supply

The demand and supply of ice in Kayar was estimated in this survey (Tables III.2.2-1 and III.2.2-2). There is only one plate ice plant with an installed capacity of about 20 tons per day (tpd) operated by Centre de Mareyage de Kayar; the annual average operational capacity is 100 percent except in lean season. The ice produced in Kayar is used mainly for fisheries.

The estimated total ice demand was about 33 tpd in 1995 (13 tpd for gill net and line fishing and 20 tpd for marketing) at ice fish ratio of 1:0.5. The existing ice plant produced about 20 tpd, and there was a shortfall of about 13 tpd, which was covered by supply from Dakar. Maximum ice demand was about 90 tpd during glut

season and minimum demand was about 8 tpd. Large shortfall is covered by ice supply from Dakar.

With the incremental fish production envisaged under the project, an average demand of ice is expected to increase to 46 tpd (19 tpd for gill net and line fishing and 27 tpd for marketing) in 2010. However, during glut season, the maximum ice demand could be about 120 tpd and during lean season the minimum demand could be about 10 tpd. The ice production in 2010 is about 20 tpd and the supply from Dakar is assumed to be 13 tpd, and the ice deficit is about 13 tpd. As of now there is no plan for installation of new ice plant by the private sector, it is desirable to increase the installed capacity of the existing ice plant to cope for the immediate shortfall of ice. The supply of block ice from Dakar is expected to continue due to closeness of Kayar to Dakar.

The general complaint by the fishermen and wholesalers during the workshop and field survey was that the supply of ice was unstable and not available when they are in need of ice. The unstable supply of ice is attributed to simple economics, that is the price of ice during lean season may decrease while the production cost may not change and vice versa, the price may increase while the production cost may decrease during glut season. The private ice manufacturers in Dakar may regulate the production of ice and this may be the cause of unstable supply of ice.

The price of plate ice to fishermen is FCFA 1,000 a box (40 kg), and the block ice from Dakar is sold at about FCFA 800 a block (25 kg). The fishermen pay FCFA 32/kg for block ice from Dakar and 25 FCFA/kg for plate ice.

(3) Fish Storage

Fresh fish storage

Daily there are two cycles of landing of gill net and line fishing boats, which land mainly the high priced fish and other fish (by catch). Some boats land in the morning hours and some in the late afternoon. The high priced fish landed in the morning hours are purchased by wholesalers and kept in boxes with ice in their houses or on road sides till the arrival of trucks in Dakar in the afternoon. As a result there are some quality loss due to non-availability of proper storage facilities. Fresh fish storage of about 15 tons capacity could be considered for the benefit of the wholesalers.

Frozen fish storage

There is no processing of frozen fish in Kayar. In Senegal the frozen fish destined for export are mainly caught and frozen by industrial fishing boats and exported from Dakar. In Kayar freezing of fish is not considered because of low

demand for frozen produced in Kayar, and good access to the industrial fish processing plants inDakar.

(4) Fish Marketing Information System

Likewise in Saint Louis, formal fish marketing information system does not exist except for the informal exchange of information on landing quantity, fish price, fish order of processing firms, and request of marketing services such as rental of trucks and among wholesalers in Kayar and Dakar and other areas, which seems to have quite well established due to closeness to Dakar.

(5) Marketing Regulations

There is no formal marketing regulation in Kayar, though the Centre de Mareyage de Kayar functions as a wholesale center production area under a Decree. However, the wholesalers restrain themselves from purchasing high price fish from fishermen (or exercise a regulating role to save resources); who follow a certain regulation they have set up for themselves not to catch or go fishing two days a week for high price fish in order to conserve fishery resources.

2.2.2 Sector Plan

(1) Development Goals and Concept

Development goals

The development goals are to:

- Centralize the currently scattered wholesale activities in the migrant and traditional villages of Kayar by establishing a new complex
- Establish suitable price mechanism
- Increase fish supply to Dakar, interior area and for export

Development concept

The marketing activities of the landed fish is currently disorganized along the beach; from landing, purchasing, transferring to trucks and icing and loading on to trucks are conducted in a narrow, crowded and congested area (decentralized manner). Wholesalers and assemblers wait for the arrival of boats in temporary shacks and sheds. Truck wait along the public roads causing nuisance to the public.

With the incremental production by the year 2010, the fish landing and marketing pattern without the project is shown in Fig. III.2.2-3. It is envisaged there will be further congestion and chaos in the landing and marketing activities in the resident and migrant villages.

The development concept is to centralize the marketing activities (i.e. from landing to marketing in the production area) in the migrant village and traditional villages through the establishment of the proposed components in the new complex.

All fish sales transaction is proposed to take place under one roof in the new complex as shown in Fig. III.2.2-4 and Fig. III.2.2-5.

Regulated marketing system will be introduced through implementation of marketing regulations, and also the management and use of the facilities and equipment will be implemented by the fishermen and wholesalers through formation of associations. In this regard education and training programs are also envisaged. Fish marketing information system network linking Kayar with Saint Louis and Dakar will be introduced (refer Fig. III.1.2.5 and Fig. III.1.2-6).

(2) Facilities and Equipment

The project facilities and equipment proposed for the new complex are as follows.

The newly proposed complex is to be located in the existing resident and migrant village in Kayar, and the objectives are to:

- Locate the complex in the existing traditional and migrant village
- Centralize landing and marketing of the landed fish
- Ease congestion in the traditional and migrant villages

The complex is expected to handle an estimated quantity of about 23,214 tons in the year 2010; the daily quantity is about 78 tons which comprise 40 tons of sardine, 12 tons of high priced fish and 26 tons of other fish. The complex will contain the following facilities and equipment.

1) Market hall
2) Ice plant
3) Ice and fish storage
4) Quality control & inspection room
5) Wholesalers room (traders room)
6) Storage area for processed fish
7) Truck berth
8) Marketing information system network

1) Market hall

Objective

The objectives are to:

- Centralize marketing in an orderly manner
- Transact sales of fish between fishermen and wholesalers under one roof

Capacity

The market hall is expected to handle about 78 tons of fish a day and it will be used for receiving the landed fish, sorting, icing, packing and loading on to trucks. The following assumptions are used in the estimation of space.

- About 78 tons of fresh fish will pass through the market hall.
- About 20 tons (50%) of sardine will be directly loaded on to trucks from landing.
- About 20 tons will be landed in the morning hours.
- About 23 tons of fish for artisanal processing.

Staffing

Required staff will be a total of three; market hall manager or supervisor with two workers.

2) Ice plant

Objective

The objective is to provide stable supply of ice in view of the increase demand in future as the existing DOPM ice plant (plate ice of 20 tpd capacity) is more or less fully operated and will not be able to increase production.

Capacity

The assumptions used in the estimation of the ice demand are as follows (refer Table III.2.2-2).

- Ice fish ratio is 1:0.5.
- Purse seine boats do not carry ice for fishing.
- Gill net and line fishing boats carry ice for fishing.
- Volume of fish allocated for processing do not need ice.
- High priced fish and other fish need ice for marketing.

The estimated ice demand in 2010 is about 46 tons per day (tpd). About 20 tpd of plate ice is produced in Kayar (existing ice plant of DOPM), and about 13 tpd of block ice is brought from Dakar. The estimated ice shortfall or deficit is about 13 tpd.

Staffing

Required staff will be one technician.

3) Ice and fish storage

Objective

The objectives are to:

- Stock ice in order to have stable supply
- Store temporarily high priced fish

Capacity

The volume of ice to be stored is estimated based on two days supply; that is two times of the daily production (20 tons of ice). For the storage of high price fish, it is based on the daily landing cycles of line fishing boats. The estimated landed volume of high priced fish in the morning hours is about 12 tons and the departure of this high priced fish is in the late evening. Therefore, the fish has to be kept in cool storage to maintain stable quality so as to reduce quality loss. The fish storage capacity required is about 15 tons. The total ice and fish storage is about 30 tons.

Staffing

Required staff will be two workers to assist in ice sales and fish storage.

4) Wholesalers Room (Traders Room)

Objective

The objectives are to :

- Serve the wholesalers particularly dealing in high priced fish
- Control purchase, storing and meet the order from Dakar

Capacity

- Daily quantity of fresh fish is about 55 tons.
- Handling capacity of a wholesaler is about 3 tons daily.
- Wholesaler room for about 15-20 persons is required.
- Room will equipped with desk, tables and communication facilities.

Staffing

No staff required.

5) Quality inspection room

Objective

The objective is to conduct quality inspection for direct export from Saint Louis to Europe

Capacity

It will be provided with appropriate space and necessary equipment and facilities

Staffing

The required staff will be a total of three; one technician and two assistants.

6) Storage space for processed fish

Objective

The objectives are to keep the processed fish in sheltered area to prevent contamination of soil, etc. and to prevent from insects, worms, etc.

Capacity

The processed quantity of fish in the year 2010 estimated to be around 6,855 tons or 2,285 tons of product weight; the daily processed quantity is about 8 tons. It is desirable to consider a storage space for one week supply in the complex for the benefits of the processors (users association) and wholesalers in the complex. The required space will be about 56 tons.

Staffing

The required staff will be one worker.

7) Truck berth

Objective

The objectives are to centralize the marketing and transporting, to ease the chaotic parking for trucks in the public area or main roads, and all fish trucks are to wait and load fish at designated truck berth

Capacity

The estimated truck berth space is for about seven trucks with ample space for maneuvering and waitng trucks, and it is based on the following assumptions.

- Estimated daily handling of fresh fish is about 55 tons (28 tons per cycle).
- Estimated loading a truck is about 4-5 tons.

- Number of truck required per cycle is about 7 trucks.
- Truck berth space required is for 7 trucks with ample space for maneuvering.

Staffing

Required staff will be one worker.

8) Fish marketing system network

Objective

The objectives are to:

- Collect and compile data/information on landing volume by species, fish flow volume by destination and origin, fish price by species, fish quality and meteorological data in the production (Kayar) and consumption area (Dakar) by regional DOPM offices
- Process the collected and compiled data by autonomous body using a computer for use by the users association in the short term
- Achieve a modernized fish production and distribution system.
- Attain free competition among fishermen, wholesalers, and consumers.
- Provide the marketing information to its beneficiaries by displaying at appropriate places by users association

Capacity

- A computer system with necessary facilities will be provided in the project to process the data in the short term (refer Fig. III.1.2-6).
- A main frame computer system will be provided and it will be connected to production area computer system to received and transmit data and information in the long term (refer Fig. III.1.2-7).

Staffing

Required staff will be one person with computer knowledge.

(3) Education and Training

Education and training on the understanding of regulated marketing system, on regulations of the new marketing complex, and on the management and use of the

facilities and equipment and other topics related to fish marketing is proposed in order to conduct the marketing activities smoothly.

1) Purpose and contents

The beneficiaries and users have to have an awareness and understanding of the need and the benefits of the regulated marketing system, marketing regulations and management and use of the facilities and equipment. An educational and training programme should include the following points.

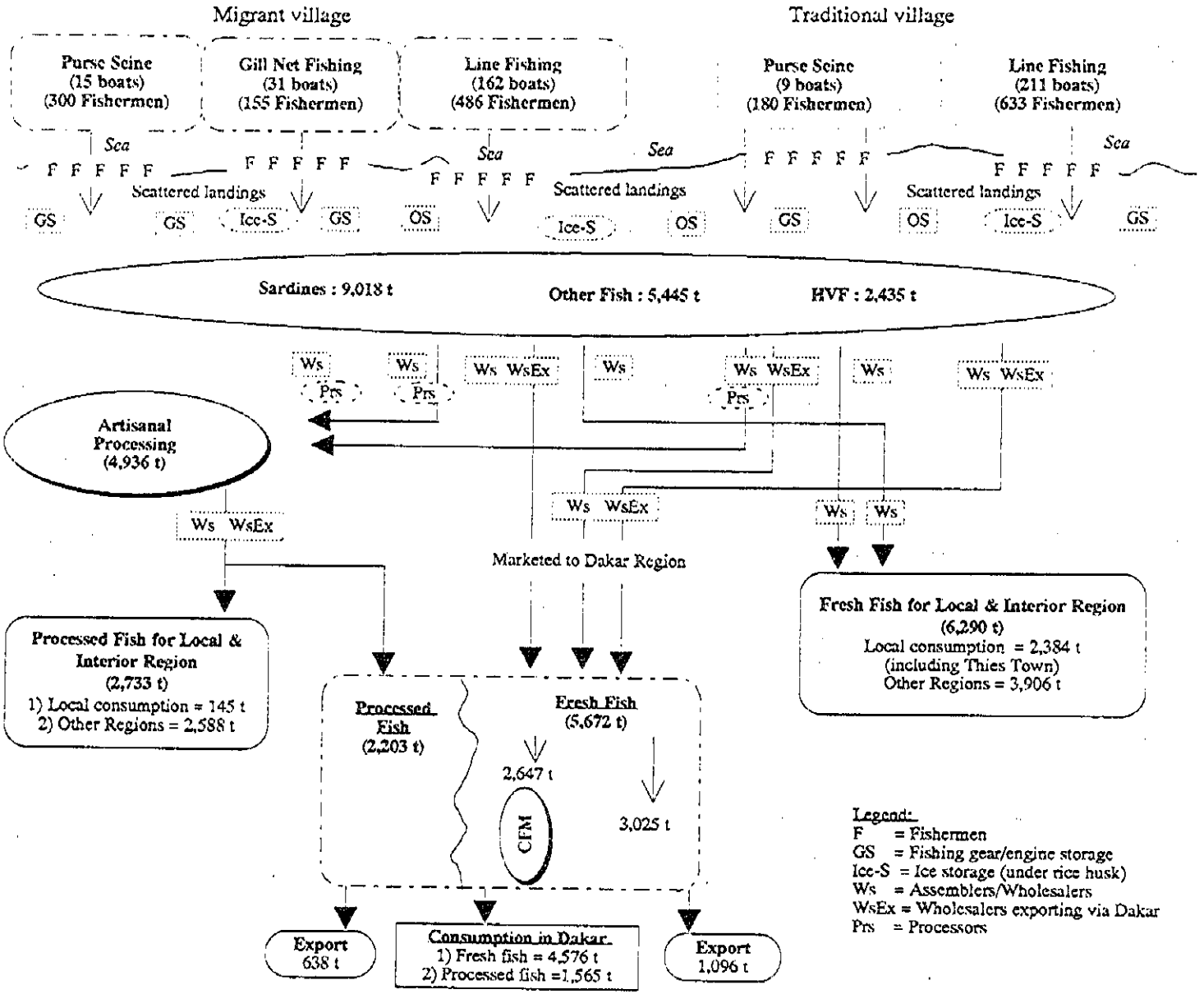
- Centralize marketing and transaction under one roof will save time
- Maintain fish quality and decrease of loss
- Provision of fair price to producers as well as wholesalers
- Fish handling during icing, packing and loading and transport
- Need to pay users fee for the use of the provided service and facilities
- On the use of the collected users fee in the operation and maintenance of the facilities and equipment
- Registration of the local wholesalers and outside wholesalers
- Transaction between fishermen and wholesalers to be conducted in the stipulated marketing area
- Fishermen are to transfer the fish to the new marketing complex
- Icing, packing loading to be conducted in the designated area
- Use of the facilities and equipment and other services

2) Target beneficiaries

- Mainly wholesalers
- Fishermen
- Transporters
- Truck owners
- Fish carriers

3) Timing and staffing

Educational and training programme should be conducted once in three months using the education & training room in the complex, and the required staff is one staff knowledgeable in fish marketing, marketing regulations, and fish quality



Source: Field Survey of Phase I (The Study on the Development Program for Northern Fishing Areas in Senegal), Oct.-Dec., 1996

Fig. III.2.2-1 Fish Marketing Pattern and Volume of Kayar (1995)

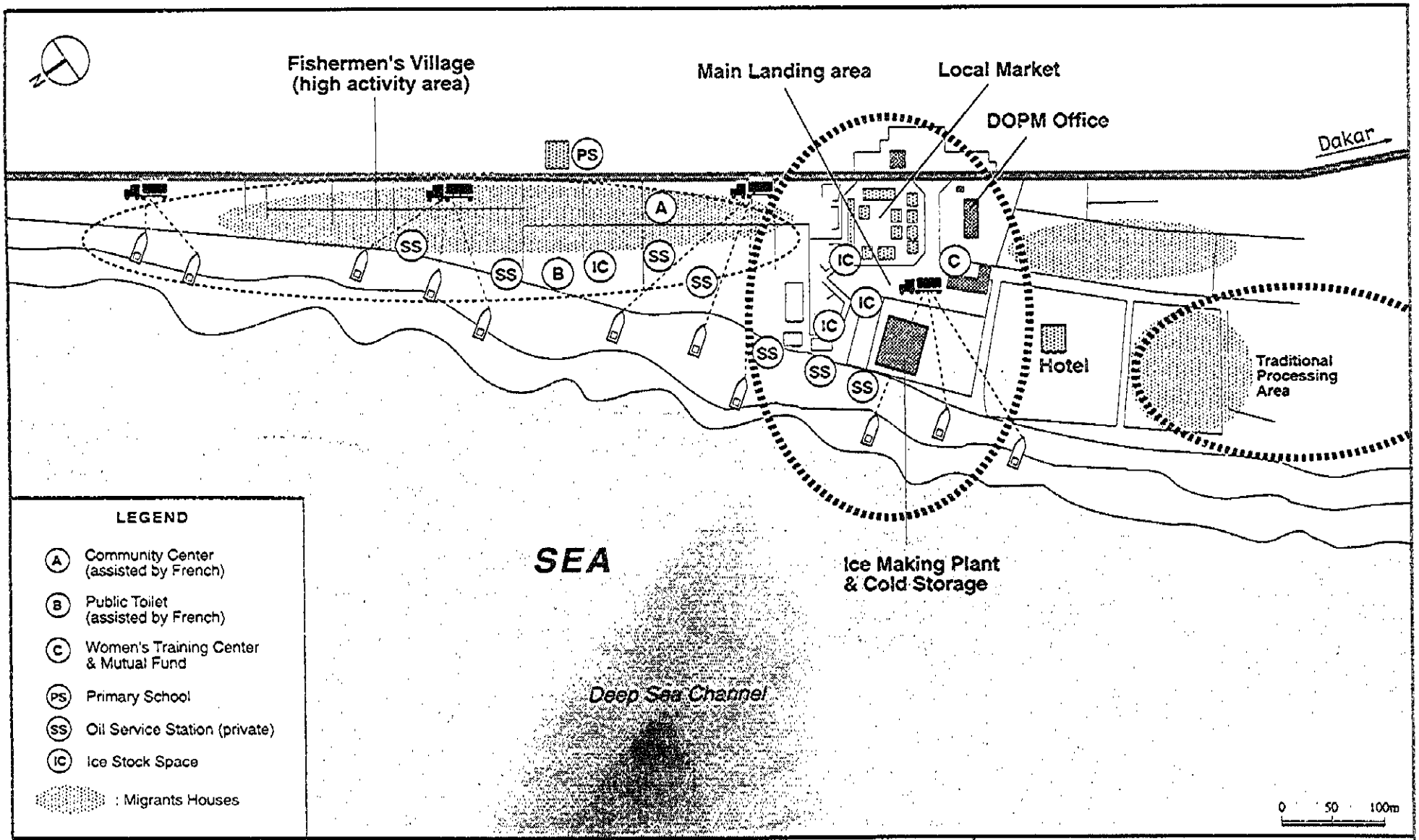


Fig. III.2.2-2 Fish Landing and Marketing System in Kayar (1995)

THE STUDY ON THE DEVELOPMENT PROGRAM
FOR NORTHERN FISHING AREAS
IN THE REPUBLIC OF SENEGAL
JAPAN INTERNATIONAL COOPERATION AGENCY

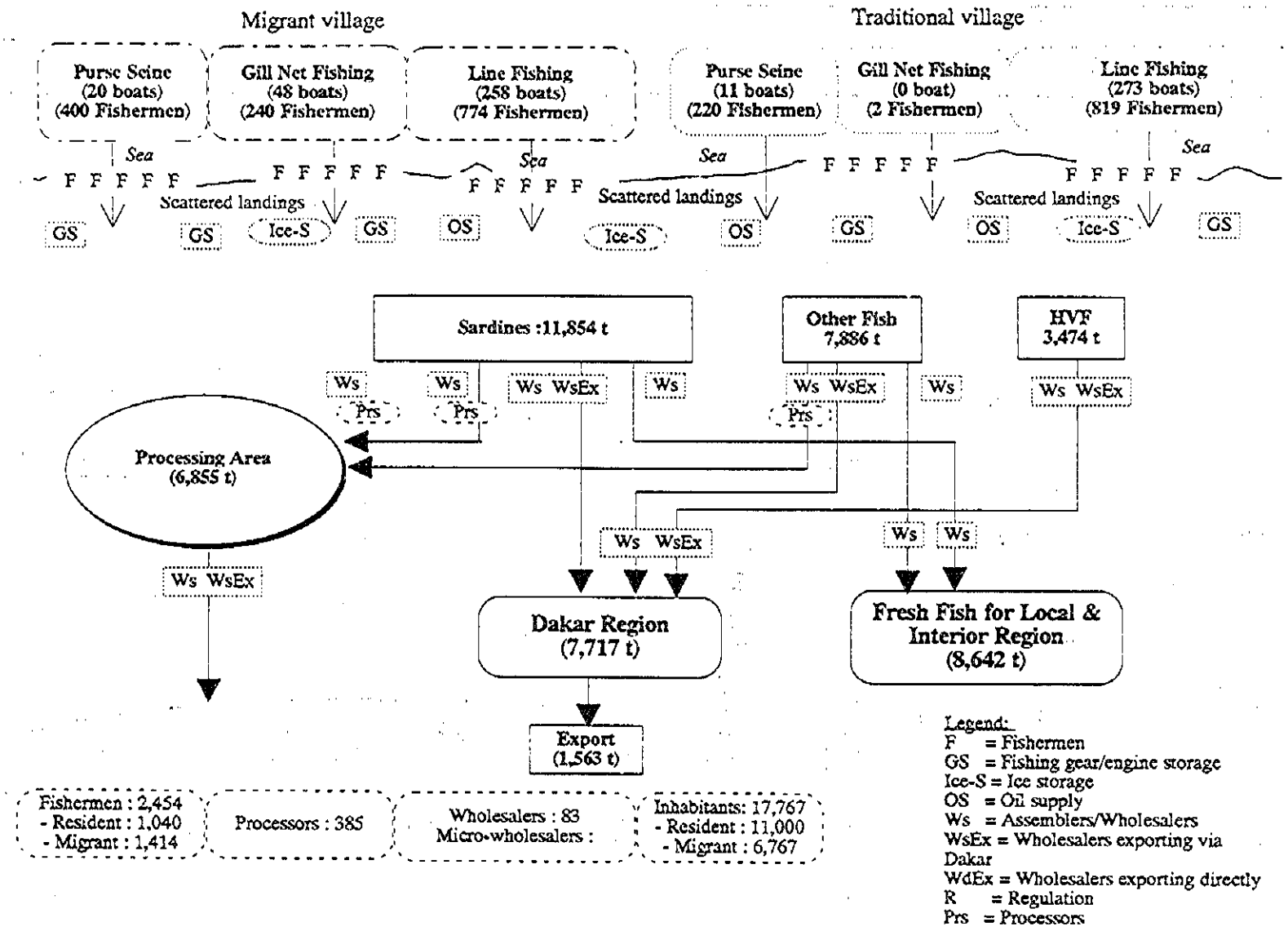


Fig. III.2.2-3 Fish Marketing Pattern and Volume without the Project of Kayar (2010)

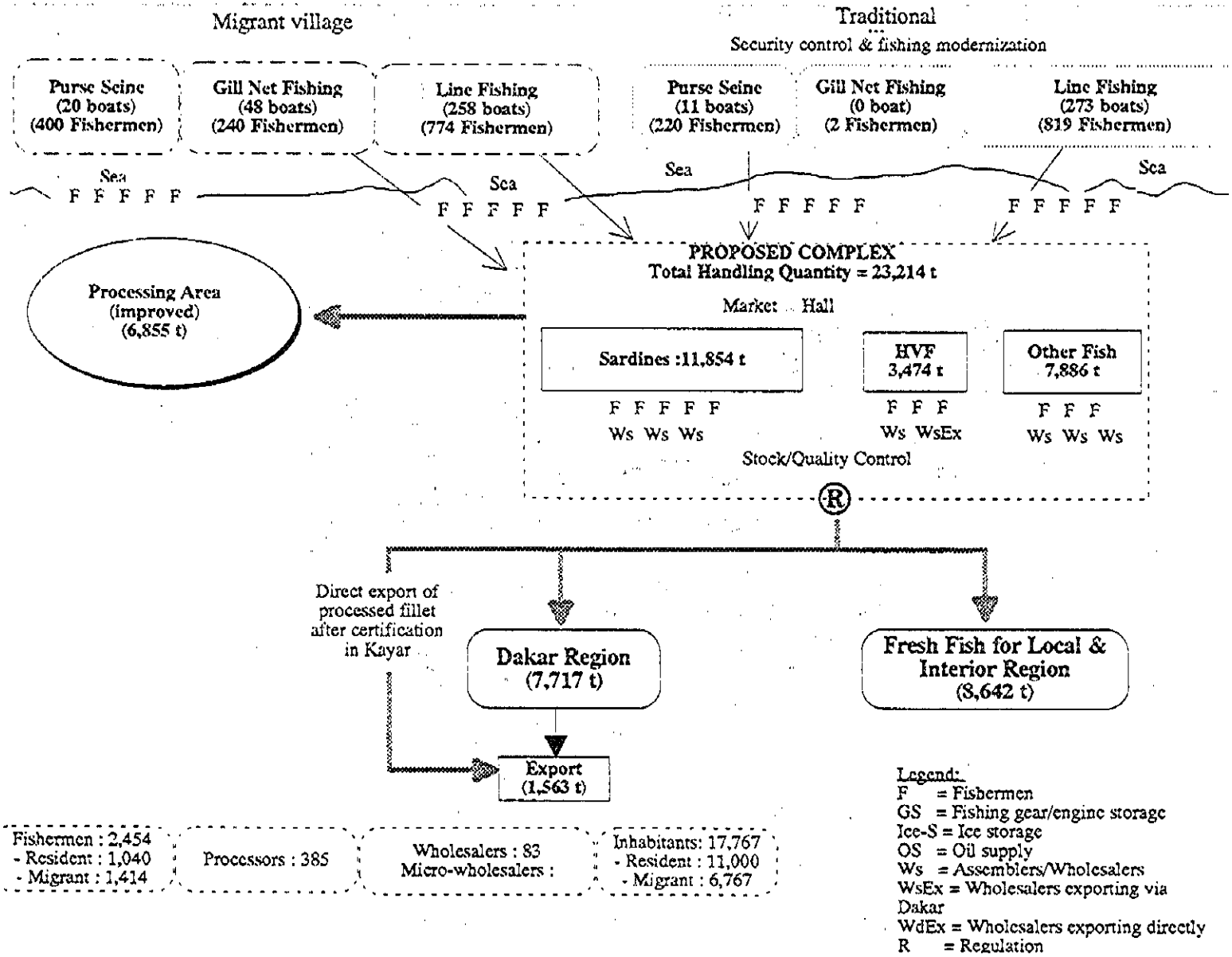


Fig. III.2.2-4 Fish Marketing Pattern and Volume of Kayar with the Project (2010)

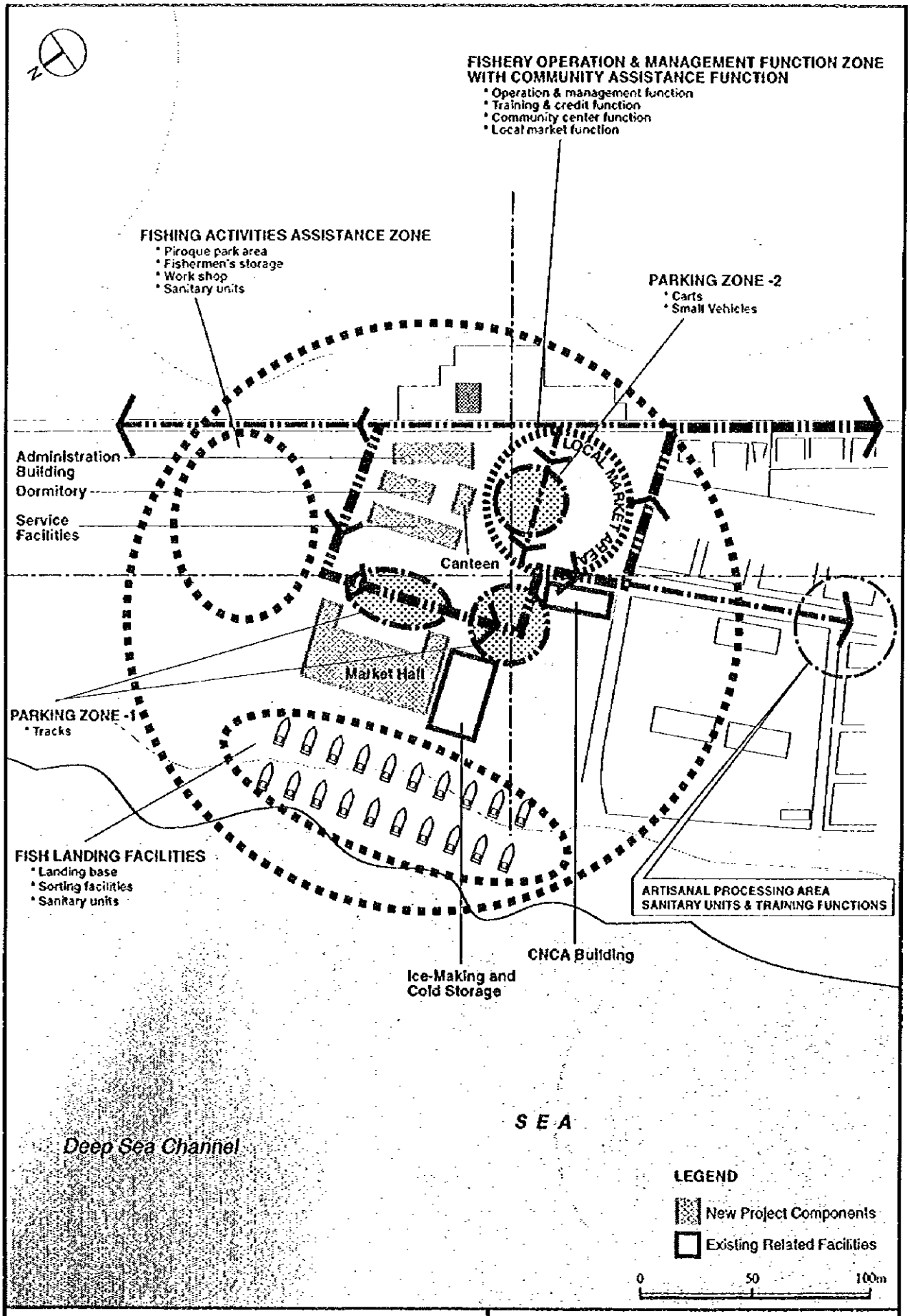


Fig. III.2.2-5 Fish Landing and Marketing System in Kayar with the Project (2010)	THE STUDY ON THE DEVELOPMENT PROGRAM FOR NORTHERN FISHING AREAS IN THE REPUBLIC OF SENEGAL JAPAN INTERNATIONAL COOPERATION AGENCY

Table III.2.2-1 Estimation of Ice Demand and Supply in Kayar in 1995

A. Ice Demand

	Fish Production in (1995)	Daily Fish Production (1995)	Ice required daily (fishing) (tpd)	Ice Required daily (marketing) (tpd)	Ice Demand (tpd)	Max. Ice Demand (tpd) in Feb.	Min. Ice Demand (tpd) in Oct.
1. High Value Fish	2,435	8	4		4	10	2
a. Processed							
b. Fresh	2,435	8		4	4	10	2
2. Other Fish	5,445	18	9		9	14	1.5
a. Processed	2,717	9		No ice			
b. Fresh	2,728	9		5	5	6	1
3. Sardine	9,018	30	No ice				
a. Processed	2,221	7		No ice			
b. Fresh	6,797	23		11	11	50	1.5
Total	16,898	56	13	20	33	90	8

B. Ice Supply

1. Ice production in Kayar of one existing plant (full operational capacity)	20	20	10
2. Ice from Dakar	13		
Ice surplus/deficit in Kayar	0	-70	2

Remarl 1) Fish ice ratio is 1:0.5 for both fishing and marketing.
2) Operational capacity of one ice plant (plate ice) in Kayar is about 100%.
The rated capacity is 20 tpd.
3) About 13 tpd of ice (block) are assumed to be brought from Dakar.

Table III.2.2-2 Estimation of Ice Demand and Supply in Kayar in 2010

A. Ice Demand

	Fish Production in (2010)	Daily Fish Production (2010)	Ice Required daily (fishing) (tpd)	Ice Required daily (marketing) (tpd)	Average Ice Demand (tpd)	Max. Ice Demand (tpd)	Min. Ice Demand (tpd)
1. High Value Fish	3,474	12	6		6		
a. Processed							
b. Fresh	3,474	12		6	6		
2. Other Fish	7,886	26	13		13		
a. Processed	3,935	13		No ice			
b. Fresh	3,951	13		7	7		
3. Sardine	11,854	40	No ice				
a. Processed	2,980	10		No ice			
b. Fresh	8,934	30		15	15		
Total	23,214	77	19	27	46	123	10

B. Ice Supply

1. Ice production in Kayar of one existing plant (full operational capacity)	20	20	10
2. Ice from Dakar	13		
Ice surplus/deficit in Kayar	-13	-103	0

Remarl 1) Fish ice ratio is kept the same.
2) The existing plate ice is rehabilitated after its lifespan
The total rated capacity is 20 tpd in 2010.
3) The operational capacity is 100%
4) Ice from Dakar 13 tpd.

2.3 Sector 3 : Artisanal Fish Processing

2.3.1 Existing Conditions and Future Prospects

(1) Artisanal Processing

The processing industry in Kayar employs about 350 women. Although the processing industry does not suffer from a shortage of land as in the case of Saint Louis, nonetheless the low productivity of traditional processing methods is the same. In addition, due to its location in the urban outskirts, the demand for fresh fish is high and the difficulty of securing low cost ingredients has greatly impeded the development of the processing industry. Furthermore, large increases in fish production are not anticipated and population growth has increased the demand for fresh fish. Therefore, the supply of raw ingredients has not increased, with the exception of a segment of certain fish species, and production levels in fish processing are expected to remain at current levels. This project aims to secure employment for women as in the Saint Louis project, and to improve work productivity and the work environment. The prevailing issues according to the type of processing are summarized below.

Kethiakh: Sardinelle production levels fluctuate greatly throughout the year. It is estimated that future production levels will remain near the 1995 volume of 10,000 tons (see chapter on fish production). Therefore, the supply volume of the Kethiakh ingredient will not increase greatly from present levels; and the production volume and the scope of the processing facilities are also expected to remain at current levels.

As in Saint Louis, in order to improve product quality, the work process needs to be speeded up, and the preservation of the raw fish ingredient and storage of the product must be improved. In the area of processing techniques, an improved oven provided by the UNIFEM project is in use, but adequate results have not been achieved. It is necessary to pursue modifications in these activities in order to improve processing technology, in view of the characteristics of the ingredient and fuel conditions in Kayar.

Sale Seche: Unlike Saint Louis where there was ample resources of shark which makes it possible to develop a uniform volume of production, gill net fishing is still undeveloped in Kayar. As a result, the current production volume is a low 211 tons; and future growth in production will be limited with only an anticipated increase of 84 tons. However, raw materials are supplied from the processing factories and the fish landing sites near Dakar region. Due to their concentrated and low cost collection activities, the raw material supply is expected to increase in future. As a

result, joint purchases of raw materials and joint transport activities by organized groups will be promoted in future.

(2) Fish Processing for Exported Products

Fresh fish export

Increased production of exported fish species due to promotion of offshore fisheries is anticipated. A high degree of fish quality is presently maintained during the shipping to air transport stages. With future improvements to the market, fish quality is expected to improve even further due to reduced shipping time. As a result, the current distribution pattern of fresh fish shipment to Dakar is expected to continue for the long-term.

Frozen fish export

Resources for fillet processing are fully exploited at present; and future supply volumes are expected to remain at 1995 levels. The bacteria count of frozen filet for export is extremely high and the quality is inferior, as in the case of Saint Louis. There is very little difference in the processing and transport time required and processed export products in Kayar are anticipated to increase with future improvements in the ice supply, market information, etc.

2.3.2 Sector Plan

(1) Development Objectives and Concept

Development objectives

The development objectives of the project are listed below.

- Improve the work environment of women artisanal processors.
- Improve the sanitation environment of the processing factory and the product quality of both traditionally processed fish and processed fish for export.
- Expand the processing functions of processed fish exported to the EU and other African countries.
- Improve the processing technology and level of processing skills.

Development concept

1) Facility improvements which are proposed are a roofed working area, lighting at night, etc. in order to improve the work environment, reduced work volume and hours of artisanal processors, in addition to introducing equipment which will improve work efficiency. The objective is to foster leaders and activities will be limited to the pilot project level.

2) Improve the quality of processed products

a. Artisanal processing: Measures will mainly focus on improving quality product by ensuring the minimum standard of the sanitary environment since artisanal processed products meet the dietary needs of the people. Allocation of washing water and improving the waste disposal functions of toilets will indirectly support product quality.

b. Exported processed products: Processing facilities that will meet EU standards will be constructed and processed products that meet export demands will be developed. The impact of demonstrations will be monitored and a segment of export inspection functions will be adopted.

3) A DOPM quality inspection room will be created and the function of quality control inspections will be strengthened.

4) Support for organizing activities: Education and training activities of women leaders among the traditional women processors will be implemented as a means of improving processing. Organizing processors into groups is essential for rationalization and for improvementd in their work environment, productivity and income. Processing technology, organizational operations and management skills will be strengthened.

(2) Facility and Equipment

1) Artisanal processing area

A model processing factory incorporating all the needed improvements will be constructed in the fishery complex and processors will be trained by on-the-job training (OJT). Improved processing technology, equipment and facilities will be demonstrated to all the processors in Saint Louis. Existing facilities will be improved and a new processing factory will be constructed in conjunction with an increased supply of ingredients in future.

<u>Model processing facility for artisanal product</u>

a. Functions

- Fostering model processor groups: Loaning facilities to processor groups organized under the leadership of women who have received training and to implement on-the-job training (OJT) activities
- Develop processing technology through OJT
  - Improve the productivity of each unit engaged in traditional processing through the joint use of improved equipment, improved assembly

lines, and facility layout

- Understand the quality control needs of processed products exported to other African nations (dried and salted shark meat and ray), technical improvement

- Education and training: Demonstrations targeting processors, implement training activities

b. Facilities

Processing area

The facility which is planned in this project will be a demonstration facility with the objective of increasing production by 20 percent of the existing processing plant; and the scope of daily production levels is set at 1,300kg (920m^2). The present handling volume per worker of 20kg/day is targeted for this facility and one group will be composed of ten workers and the facility will be loaned out for their use. The facility will contain a drying area, fish preparation area (cutting, gutting), and a salting area. A system of incorporating the entire work process into one area will be introduced. At present, each work stage is carried out separately.

Storage for processed products

The entire production volume of traditionally processed products of 1,644 tons in Kayar will be targeted. A 120m^2 storage facility will be constructed and a two week storage period for the processed products will be allowed.

c. Equipment

Artisanal processing equipment which is currently in use in Senegal will be employed and equipment requiring the training of new technical skills will not be included. In addition, only equipment which is manufactured and can be purchased in Senegal will be used. Equipment such as fish containers and carrying utensils, washing and salting tanks, drum cans, and baskets for handling boiling fish which will improve and raise the efficiency of processing techniques, will be included. As expensive equipment will not be provided, processing groups will be expected to purchase the equipment. In addition, a system of purchasing the equipment using small credit may also be possible. As a result, the purchase of equipment which will be used in the demonstration facility will be kept to a minimum. The equipment needed are: drying table, plastic tank, plastic basket, fish container, work table.

2) Demonstration plant for high quality export products

Exported processed products, particularly filet and shrimp processing, and packing fresh fish will be targeted. The facility will be leased to private companies and on-the-job training in sanitation and quality control will be implemented. In addition, the DOPM quality inspection room will be used jointly, and product quality will be monitored and the production of a high quality product is targeted. The plant will maintain standards that will meet the EU criteria for exported products. The production capacity will be 800 tons/year, $80m^2$, equivalent to the average standard of a small-scale export processing plant in Dakar (excluding production plants producing more than 5,000 tons). The equipment will include: air conditioning, work table, plastic container and tank, defroster, refrigeration and cold storage facilities.

3) Quality inspection room

Of the fresh fish landed in Kayar, domestically consumed fish is usually heated. Therefore, a sensory test will be carried out to determine fish quality which will also be conducted on exported frozen fish. Processed filet will be required to undergo a bacteria test. The bacteria test will be limited to simple and inexpensive testing of general bacteria and colitis germ colonies. Other tests will be consigned to ITA or other institutions with laboratory facilities.

Equipment: Refrigeration and freezer facilities, incubator, glass utensils, digital measuring device, microscope, thermometer, testing table

(3) Education and Training

Education and training activities for the processors will be the same as the activities which will be implemented in the Saint Louis Project.

(4) Institution and Organization

Institutions and the organizational setup will be the same as in the Saint Louis Project.

2.4 Sector 4 : Fishing Community Development

2.4.1 Existing Conditions and Future Prospect

The constraints for improving living conditions in the fishing villages in Kayar are mainly caused by the two major problems mentioned below:

1) Limited income opportunities
2) Poor BHN (Basic Human Needs) infrastructure
3) Significant population fluctuations, caused by migrant fishermen and their families between the peak and lean fishing seasons

Kayar, a traditional fishing village located near the Dakar region on the Grand Cote, has a population of 8,500 (only the permanent residents included), according to the data from the Population Census and the Population Projection done by the Department of Statistics in 1988. Kayar is a local collectivity belonging to the Thies Region and is governed by the regional government and the Village Council.

Kayar is characterized by the great number of migrant fishermen and their families working and living in the village. They form the migrant village located near the beach, separate from the resident village. The definition of "migrant fishermen" in Senegal is described in the Sector 4 Plan of the Saint Louis Project. Migrant fishermen in Kayar can be classified into the three groups as shown in Fig. III.2.4-1.

During the peak fishing season, it is projected that there is an average of 6,000 migrant fishermen and their families in the village. Most of the migrant fishermen come from Guet Ndar in Saint Louis. According to the data given by the community leaders, one quarter of the migrant fishermen belong to Group 1 as shown in Fig. III.2.4-1, while the remaining belong to Group 2 and 3.

There were some conflicts over fishery resources between the resident and migrant groups about five years ago. Therefore, a coordination body was established in the Thies Region Office under the guidance of the President in view of the situation. Due to the efforts of the organization and the community members, the conflicts between native villagers and transmigrants were settled. The residents and migrants have since been living in harmony. However, it should be noted that the migrants do not pay tax to the local government in Kayar and they will not organize GIEs, when planning the utilization and operation of the public facilities.

Assuming that the annual population growth rate of Kayar is 2 percent based on the 1988 Census, the population of the resident village in 2010 will be approximately 11,000 persons, while that of the migrant village will be about 9,500 persons during the peak season. In 2010, the population resettled from Guet Ndar will be included in the migrant village.

The population structure of Kayar during the peak and lean seasons is summarized in Figures III.2.4-2 and III.2.4-3.

In Kayar, like the other fishing villages, women's income is important for defraying daily expenditures due to the common practice of polygamy and other traditions of fishermen families. Artisanal fish processing is one of the main income generating activities for women. Table III.2.4-1 shows the population, and the number of women and fish processors in 1995 and in 2010.

The average number of fish processors during the peak season is projected at 460 persons including 200 resident processors and 260 migrant processors. This is about a 50 percent increase from 1995 levels. However, fish production is not expected to increase at the same rate of processors.

Eventually, the production of processed fish and per capita income of women will decrease, and not a few women will lose their income generating sources, if countermeasures are not taken. However, once Kayar starts to function as the "artisanal fish processing center" located near Dakar, which is the largest consumer market as well as the "trading center of fishery and agriculture products", income opportunities will be created.

A detailed questionnaire survey on the fishing community was conducted during the Phase II study in order to identify the needs, constraints and potential of the community members, mainly focusing on the migrant fishermen and their families. Approximately 150 persons including fishermen, processors, wholesalers etc. among the permanent residents and migrants were interviewed in this survey. The following issues were pinpointed based on the data collected by the survey.

- Demographic structure and movement
- Productive activities
- Education and health services
- Social organization and professional structure of the permanent residents and migrants
- Performance of the economic groups and access to credit problems
- Income level and living conditions
- Needs and constraints at the village and professional group levels

The current conditions, needs, and constraints of the communities can be summarized as follows using the data collected from the main field and the questionnaire surveys. The output of the questionnaire survey are shown in the Annex.

The villages have no safe water supply. Currently, they buy water from the shallow wells, where water quality is not suited for drinking. They have electricity

services, however, it does not extend to many of the houses in the villages. The main road in Kayar has not been well maintained and the rural roads are in poor condition. The rural roads to the newly developed residential areas located in the northern end of Kayar have not been well developed yet. The existing retail market has not been well organized. It needs to be re-organized and improved in order to become a trading center for fishery and agriculture products destined for Dakar and for the export.

It is estimated that there are about 1,530 children between the ages of 7 to 12 years in the resident village and 580 in the migrant village The only primary school with ten classrooms is operating at full capacity, despite the introduction of a double shift system. Even at present, with the double shift system, two classrooms need to be added. Inview of the population increase, it is projected that 3,200 children of primary school ages will be in Kayar in 2010. At least another six classrooms will be needed in 2010.

The facilities and equipment in the existing health post are very limited. No water supply is available in the post, although they provide infant delivery services to community members. The post advises the patients with serious diseases to go to the regional hospital in Thies. However, there is no transportation, including ambulance cars. The health post is located far from the fish landing and processing areas, therefore, it is desirable to have a first aid facility in the complex or in the processing area.

There is no community center or training facility currently available in these villages. Near the DOPM office, there is only a women's training center, which was built by the CIDA project. This center has been well utilized and maintained by the Kayar Management Committee of UOPAGC. However, it still needs to be renovated to promote their activities, due to very limited existing and equipment for training. Literacy classes for women are currently implemented by UOPAGC using the women's center. Part of the expenses, including the salaries of the instructors are covered by the participants and the rest is paid by the CIDA project. The women's group activities including literacy classes, renting training facilities, and small credit have been well organized by the Kayar Management Committee in UOPAGC.

At present, there are no community development plans for Kayar. It is necessary to formulate an appropriate organization for implementing and operating the project proposed by the Study, which incorporates various sectors and is linked to other projects in the northern fishing areas in Senegal. The organization will be required to have good coordination, management, planning, and project pursuing capabilities as well as relevant expertise in order to make the project successful and sustainable. In addition, land acquisition for the project is one of the most important

issues that need to be solved by the organization. For example, the existing retail market, should be relocated to the new site, due to the construction of the new fishing complex; and some villagers' houses will be transferred to other areas. All of these procedures necessary for project implementation will be managed by the new organization.

In the area of future plan formulation, it is recommended that a local system of problem analysis and plan making based on community participation involving professionals and community leaders, is established in order to make the plans more viable to actual local needs.

There are several constraints to improving living conditions in both the residents and migrant villages in Kayar, which are summarized below. These constraints were revealed through the workshops held on June 3, interviews with community members and professionals, and data collected from the Detailed Survey on Fishing Community Development conducted during the Phase II study.

Employment opportunity

- Poor access to formal employment opportunities
- Limited access to training on income generating skills
- Limited access to information about formal and informal employment
- Limited access to credit for starting cottage industries
- Shortage of land for market gardening

Living Conditions in Households

- Poor sanitary conditions of households (lack of toilets, bathrooms etc.)
- Limited knowledge and awareness
  - Lack of awareness on the importance of primary education
  - Lack of knowledge on sanitation, hygiene, and primary health care
  - Lack of knowledge on gender, human rights, laws and regulations etc

Access to the Social Services

- Limited access to credit systems
- Limited access to literacy classes
- Limited access to technical training classes
- Limited access to information about sanitation, hygiene, primary health care, child care, marketing, laws and regulations etc.

Basic Infrastructure for BHN

- Lack of water supply in the residential and working areas (fish landing and processing areas)
- Limited electricity supply

- Lack of drainage systems
- Poor road conditions in the villages
- Lack of a garbage disposal system
- Limited lighting facilities along the roads and in the working areas
- Lack of communication facilities (telephone center) in the new village
- Low enrollment rate of primary education and shortage of physical, financial, and personnel capacities of primary schools
- Poor facilities and equipment and no water supply in the health posts
- Disorganized retail market system
- Lack of first aid facilities in the fish landing and processing areas
- Lack of community centers and training facilities
- Lack of nurseries and kindergartens

2.4.2 Sector Plan

(1) Development Goal

The development goal is to contribute to improvements in the living environment.

(2) Development Concept

The following components are proposed as the supporting infrastructure for improvements in the living environment. Their implementation should be carried out after legal procedures following the village development plan authorized by the village council have been completed.

The management body of the proposed project, supported by CAEP, will coordinate all the activities related to training, education, and institutional strengthening under the management committee, which will include representatives from the village council. In addition, the UOPAGC women's group will play an important role in implementing training and education for the community.

Technical cooperation from the Ministry of Health, Ministry of education, Ministry of Women, Ministry of Environment, Ministry of Public Works, and Ministry of Alphabetization is essential in order to organize and implement more practical and effective training and education programs.

(3) Functions

a. Extension of the existing primary school
   - Construction of two classrooms
   - Construction of a football field
   - Human Resource Development (HRD): two additional teachers

b. Renovation of the existing health post
   - Renovation of the health post facilities/equipment
   - Water supply and electricity

c. Relocate the existing fish and agriculture product retail market and private workshops

d. Renovation the access road and installation of street lights in the migrant village

e. Water supply to the Kayar village
   - Water supply system for multi-purpose use
   - Extend supply to the women's training center
   - Extend supply to the primary school
   - Extend supply to the health center
   - Extend supply to the retail market

f. Improve electricity supply
   - Supply electricity to the primary school
   - Supply electricity to the health post
   - Supply electricity to the retail market

g. Construct a telephone center for public use in the new complex (operated by the complex)

h. Renovate the existing women's training center facilities/equipment

i. Install first aid facilities in the new complex or the processing area

j. Install nursery facilities in the new complex

(4) Education and Training

a. Transfer technology in development plan formulation and implementation with participation of the community

b. Leadership training program for leaders of groups and GIEs (marketing, management, facility operation/maintenance, sanitation improvement, leading groups, promoting group activities, communication etc.)

c. Family health care class 1 for women of reproductive age (15-49) (primary health care, hygiene, environment protection including rubbish collection, composting, reforestation etc.)

d. Family health care class 2 for women of reproductive age (15-49) (child care, nutrition, cooking, EPI, etc.)

e. Literacy education class for community members (Wolof language including topics of home economics, human rights, hygiene, importance of education, laws and regulations etc.) = Support for the CAEP and UOPAGC literacy classes

f. Resettlement seminar for community members (planning, procedures, preparation, destination options, accommodation with destination communities etc.)

g. Promotion of the community and group activities

(5) Institution and Organization

The sector 4 sub-projects will be implemented, operated, and maintained through the relevant organizations shown below (refer to the Figure III.2.4-4).

a. The Coordination Committee will approve the plans for the sub-projects included in the sector 4 of the Kayar Project, following the Master Plan and the Action Plan by the Study.

b. The ad-hoc committee of the coordination committee which will formulate a detailed implementation program including financial and human resource allocation, will implement the sub-projects. The ad-hoc committee is responsible for completing all the necessary procedures required for implementation, i.e. making implementation schedules, land acquisition, financial and personnel resources allocation, human resource development, detailed planning for operation and maintenance, facility construction, equipment procurement etc.

c. The autonomous body of the Kayar Project will operate and maintain the sub-project as well as the facilities, equipment, and basic infrastructure in collaboration with the community groups or members.

d. The autonomous body will be responsible for formulating future community development based on community participation.

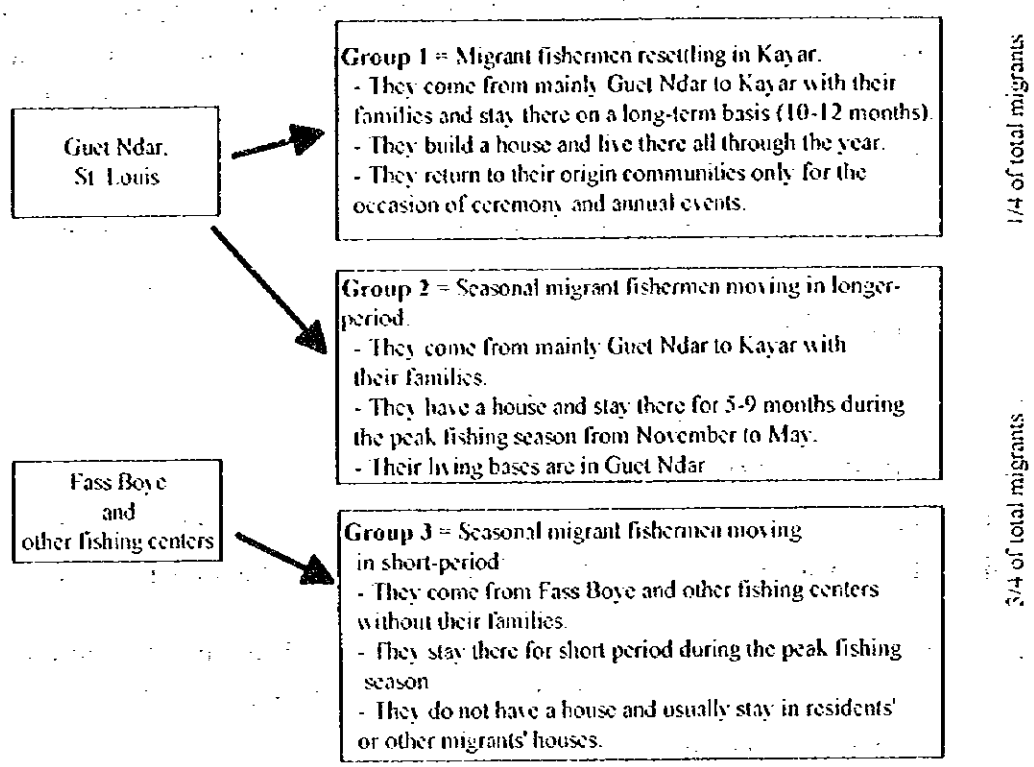
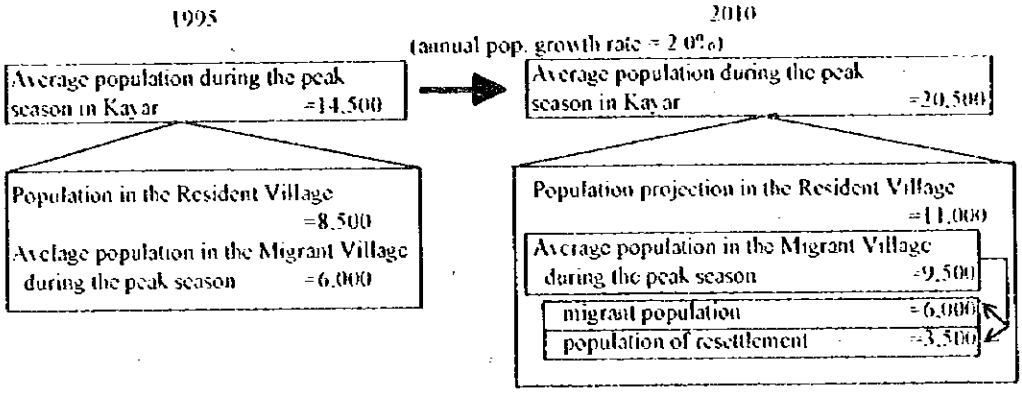
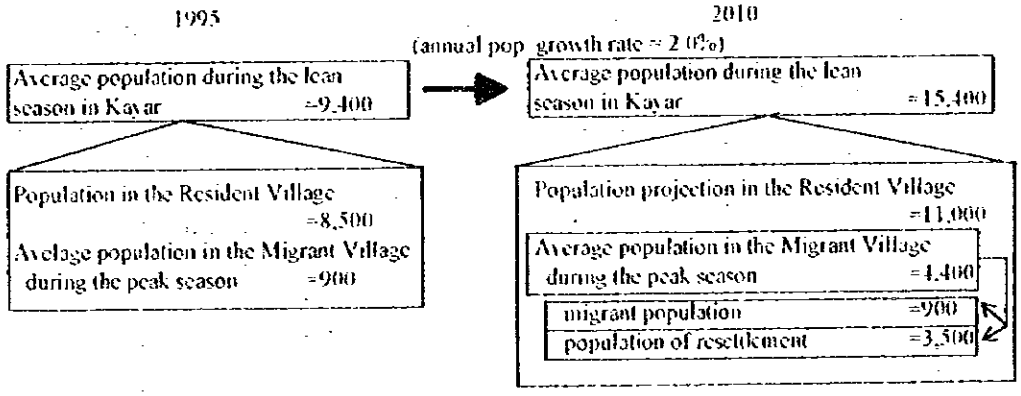


Figure III.2.4.-1 Classification of Migrating Fishermen in Kayar



(Data source: compiled by the Study using 1988 Population Census, Ministry of Statistics)

Figure III.2.4.-2 Population Growth from 1995 to 2010 in Kayar (Average population during the peak fishing season)



(Data source: compiled by the Study using 1988 Population Census, Ministry of Statistics)

Figure III.2.4.-3 Population Growth from 1995 to 2010 in Kayar (Average population during the lean fishing season)

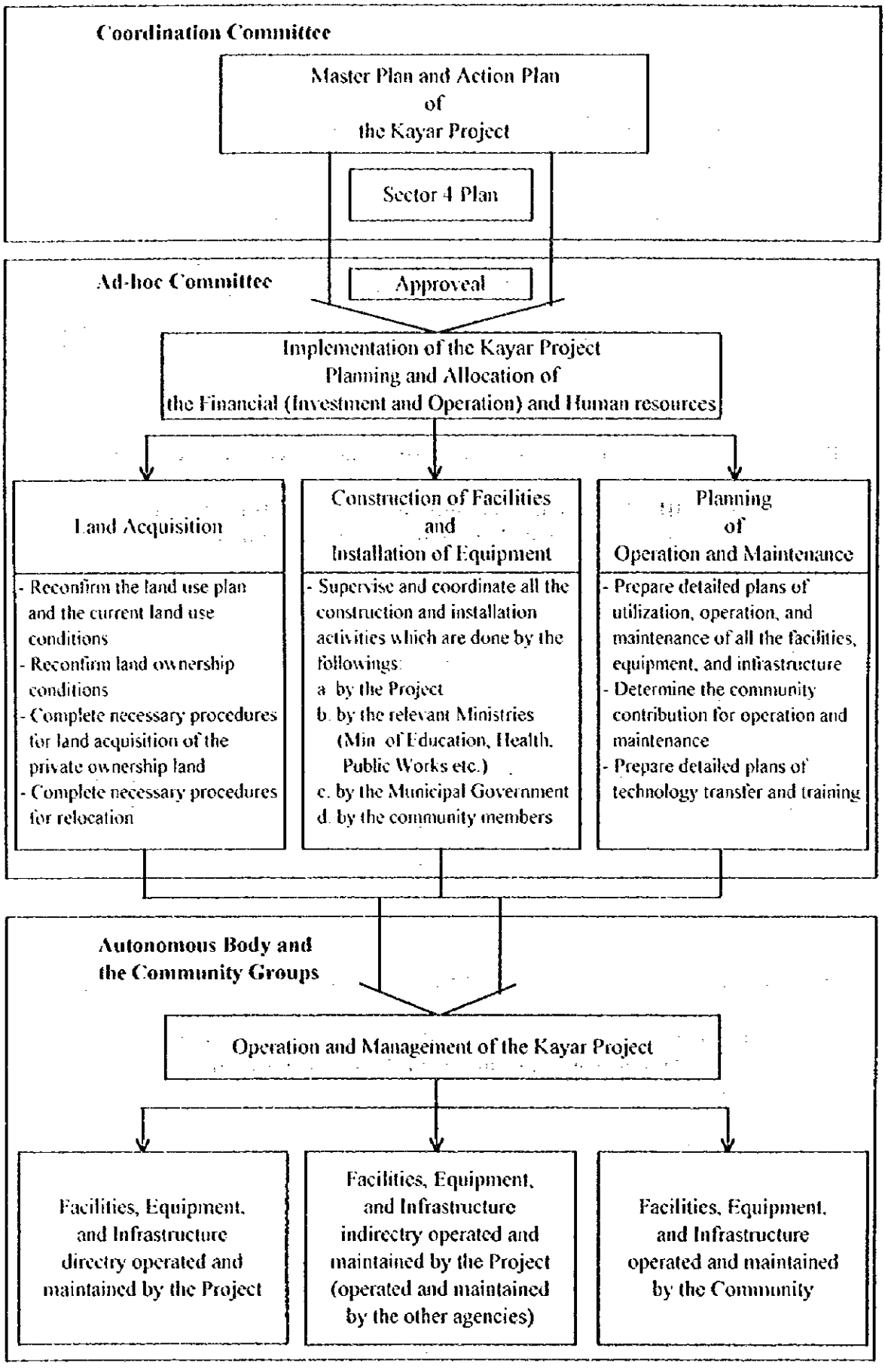


Figure III.2.4.-4 Flow of Implementation, Operation, and Maintenance of the Kayar Project

Table III.2.4-1 Population and Number of Women and Fish Processors in Kayar (1995 & 2010)

	1995			2010		
	Resident Village	Migrant Village	Total	Resident Village	Migrant Village	Total
Average population during the peak	8,500	6,000	14,500	11,000	9,500	20,500
Women	4,080	2,880	6,960	5,280	4,560	9,840
Fish processors	150	160	310	200	260	460

Source: Compiled by the Study using 1988 Population Census, Ministry of Statistics

2.5 Credit System

The credit system which is proposed in this project is based on a system of mutual funds that was organized in Kayar under the support of CNCAS, the PROPECHE Project and PAMECAS. This system of mutual funds allows its members equal access to fund use. CICM which is a system of mutual funds that is supported by France is mainly available for the agricultural sector, whereas PAMECAS, supported by Canada, will target the fisheries sector.

(1) Loan Conditions

1) The source of the loan revenue will be based only on the deposits of the members of the fishery assistance fund.
2) This is a private fund owned by its members.
3) The capital will be loaned to GIE groups rather than to individual members.
4) GIE members will be jointly responsible for repaying the loan borrowed by a GIE group.
5) Fund members are required to have more than 20 percent of the borrowed amount.
6) A fund member who is a member of a GIE will be allowed to borrow a maximum of FCFA 100,000.
7) The owner of a purse seine may borrow a maximum of FCFA 500,000 on an individual basis.
8) Repayment period: Six months
9) Deposit rates: 6%
10) Loan rates: 12%

(2) Parties Eligible for Fishermen Loans

Local residents, GIE, and owners of purse seines will be eligible for loans.

(3) Wholesalers and Processors

Wholesalers and processors are mainly composed of women who will be eligible for loans as a GIE members. Each female member is eligible to borrow FCFA100,000.

(4) Operating Expenses of the Credit System

The latent demand of potential loan applicants has been projected at 25 percent during the initial three year period (1997 to 1999), 50 percent for the next third year

period (2000 to 2002), and 100 percent in the last third year period (2003 to 2005).

The local fund office in Kayar has presently allocated FCFA 6 million in loans and presently maintains FCFA 11 to 15 million in deposits (300 deposit accounts).

In order to meet the demand for loans, about FCFA 56.7 million will be needed in Kayar in 1999; and FCFA 72.4 million in 2002. A breakdown of this capital shows that 60 percent will be made up of loans, 30 percent for investments (deposits), and 10 percent for basic management capital.

During the initial three years, this credit system will be managed and operated by two staff members which will increase to three full-time members by 2003. Their total monthly salaries will be FCFA 1.75 million in Kayar in 1999, FCFA 2.27 million in 2002, and FCFA 2.38 million in Kayar and FCFA 2.70 million in 2005.

In order to suppress the new additional interest rates as much as possible for fund management operations, it is recommended that the costs incurred for office expenses, purchase of accessories, salaries, the operating costs of the Board of Directors, salaries of temporary employees (training, surveys, etc.), etc. are paid for by the project.

Table III.2.5-1 Projected Capital Amount for the Kayar Project (until 2005)

Unit: Million FCFA/Month

	1997 - 1999			2000 - 2002		2003 - 2005	
	Number of loans	Loan amount		Number of loans	Loan amount	Number of loans	Loan amount
(1) Loan Amount							
- Fishing Operations	53	15.8	28%	66	19.8	80	23.7
- Gill Net Fishing	0	0.0	0%	0	0	0	0
- Purse Seine Fishing	2	1.0	2%	3	1.5	4	2
Sub-total	55	16.8	30%	69	21.3	84	25.7
- Wholesalers	6	6.0	11%	8	8	9	9
- Processors	15	15.0	26%	19	19	23	23
Total	76.0	37.8	67%	96.0	48.3	116.0	57.7
(2) Total investment amount (deposits)		18.9	33%		24.1		28.9
Loan Investment Amount		56.7	100%		72.4		86.6

Table III.2.5-2 Projected Management Costs of the Kayar Project (until 2005)

Unit: Million FCFA/Month

	1997 - 1999		2000 - 2002		2003 - 2005	
	Operation cost	Ratio	Operation cost	Ratio	Operation cost	Ratio
Staff salaries	0.36	21%	0.54	24%	0.54	23%
Office expenses	0.75	43%	0.89	39%	0.89	37%
Others	0.17	10%	0.24	11%	0.24	10%
Sub-total	1.28	73%	1.67	74%	1.67	70%
Paid interest, etc.	0.47	27%	0.6	26%	0.72	30%
Total operation expense	1.75	100%	2.27	100%	2.39	100%

2.6 Physical Design

(1) Design Standard and Parameters

Design standard and material

Japanese Standard and local standard.

Seismic force = Zero

Design wind force = 60 m/s

Reference Levels = IGN for land elevation, Sea Chart Datum for tidal levels

(M.S.L 1.00 m = I.G.N. 0.00 m)

Bearing Capacity of soil = approx. 20 ton / sq.m

Reinforced Concrete structural frame.

Direct independent foundation (without piling).

Brick / block walls, with painting

Roof concrete slab or metal roofing material.

Wave run-rp elevation

From results of wave calculation, the wave run-up height for different return periods are as follows:

Wave run-up height by each return period for Kayar

Return period (year)	Deep Water Wave Height H_0 (m)	Equivalent Deep Water Wave Height H_0'□(m)	Rmax(m)
30	5.40	3.40	4.50
10	5.10	3.20	3.70
1	4.40	2.80	3.00

The wave with a return period of 30 years was applied in design for the complex, i.e. equivalent to I.G.N. + 3.50 m at Kayar.

Soil condition

From the soil investigation survey conducted, it was found that the soil on site is mainly sand with a water table at about 2 ~ 3.5 m below ground level. The soil is essentially made of moderately compact to very compact sand, with a very hard lateritic rock layer at about 6 ~ 8 m below ground level.

As in the case of Saint Louis, the close proximity of the sea has caused the

ground water to exhibit high chloride and sulphate contents and it would be advisable to use special coating on foundation or special concrete to resist the attack.

(2) Land Ownership and Preparation

The land for the complex is presently occupied by the existing ice plant, DOPM office, local retail market and some houses of the fishermen community. The ice plant and DOPM office are on government owned land so consensus of the various ministries to develop the land will be readily obtained. The local retail market and fishermen houses are on public land that is under the jurisdiction of the rural council. Relocation of retail market to the land presently occupied by DOPM office will resolve this problem. However, relocation of some of the fishermen houses that are within the project boundaries must be resolved by the rural council before the start of construction.

(3) Facilities Zoning Concept

The complex is divided into 4 major zones:

1) Market, Administration & Training zone
2) Fishermen Activities Support & Workshop zones
3) Local retail market and transportation service zone (bus terminal)
4) Processing zone

The grouping of these facilities into these 4 major zones is to facilitate activities coordination and rational / efficient use of facilities.

(4) Facilities Design Capacity

Market hall

The capacity of the Market Hall has been designed to accommodate the fish volume handled in the peak period of an average day's catch pattern divided into 3 periods. The average daily catch volume was calculated by dividing the yearly volume by 300 fishing days.

The elevation of the Market Hall floor has been set at I.G.N.+4.00m in order to meet the 30 year return period wave run-up height.

Apron

The apron is designed to accommodate the temporary loading and unloading operations of material, fuel, fish, etc. and to serve as a preliminary sorting area before the catch is transferred to the Market Hall.

At the toe of the apron, the gabion mattress is provided for erosion control to protect the apron structure.

Truck berth

The number of trucks that can be accommodated in the truck berth area is calculated based on the design volume handled by the market hall. To meet peak demand periods, truck waiting berth area is provided.

Ice plant

The capacity of the Ice Plant is based on the design volume handled by the market hall and the capacity of the existing ice plant. The ice produced is to meet the ice demands for fishing operation at sea, fresh fish transport / marketing, temporary fish storage, and for the test operation of the fish collection depot. Deficit ice supply will be met by ice supply from outside the area.

(5) Equipment Provision

Equipment has been provided for the various sector activities and to meet the rational operation and maintenance of the complex.

(6) Electricity and Water Services

The existing electricity and water services in the village is inadequate to meet the demands of the new complex. With existing normal trend of electricity demand in the village, the installation of a transformer at the complex will suffice to meet the increase demand. The water supply borehole for the existing ice plant shows sign of salt intrusion and will not be sustainable with over the medium term especially with the additional new ice plant and complex water requirement. It is recommended to bring water from an investigated known groundwater source 3.5 km away to eliminate the risk of salt intrusion into the water borehole.

(7) Waste Handling Facilities

Waste water

Independent septic tanks with seepage pit for overflow will be provided to contain the waste discharge from toilets. Periodic emptying of the septic tanks will be necessary by vacuum pump truck. Waste water from washing of the Market Hall will pass through solid waste trap / screen to remove the solid and suspended waste before the waste water is discharged to the sea. The good flushing characteristics of the sea in front of the complex will ensure that the waste will be disperse into the ocean without accumulation or concentration.

Fuel spillage and fire

The fuel service area will incorporate fuel trap to trap accidental fuel spillage and fire extinguishers to fight fires.

Visual impact

Land scaping will be done to minimise the visual impact and to control the sand dune movement as part of the forested belt.

Environment / services management

Rubbish bins will be provided at strategic locations to collect rubbish to ensure sanitary conditions. A collection system will be managed by the autonomous body in collaboration with the community rubbish collection service to collect the rubbish on a regular basis to take it to a designated dumping yard. Maintenance of the dumping ground for Kayar must be initiated to control unlawful dumping, control of vectors, fire hazards and separation of bio-degradable rubbish for subsequent composting. The money collected by the autonomous body for the rubbish collection service could be used to fund various campaigns (sanitary and health awareness, cleaning, rubbish reduction, composting, etc.) and to maintain the rubbish collection services facilities and equipment.

Maintenance of the complex water supply network to check for water leaks, deterioration of piping, pumps, water tanks / tower condition must be undertaken periodically by the autonomous body.

Autonomous body to maintain the sewage system from funds collected from water charge and to encourage community participation in & responsibility for cleaning up the common areas. Awareness campaign on use and maintenance of modern toilets, sanitation problem and related health issues of unhygienic conditions to be undertaken.

Autonomous body to maintain cleanliness of the facilities and to run cleanliness awareness campaign to increase awareness of users and community. Upkeep of site's landscaping trees / vegetative cover, and maintenance of site's drainage by getting rid of sand or rubbish that may be accumulated or blown on to the site, must also be done by the autonomous body.

(8) Activity flow / movement

The facilities are designed bearing in mind safety, ease of operation, and the flow / activity pattern of material, people and traffic. To avoid accidents, whenever possible, people and vehicle traffic are separated.

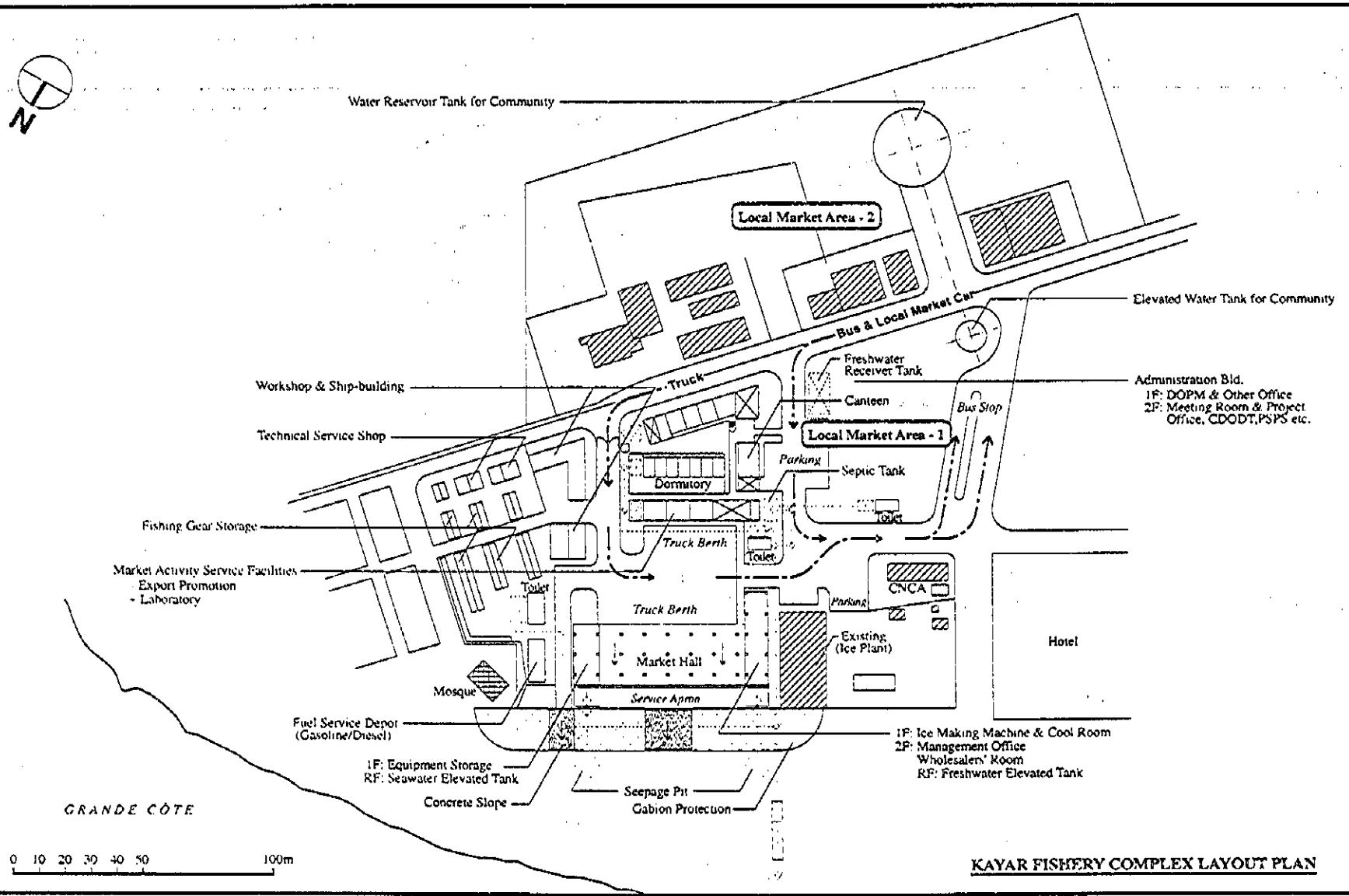


Fig. III.2.6-1 **Layout Plan of Kayar Complex (Facilities Plan)**

THE STUDY ON THE DEVELOPMENT PROGRAM
FOR NORTHERN FISHING AREAS
IN THE REPUBLIC OF SENEGAL
JAPAN INTERNATIONAL COOPERATION AGENCY

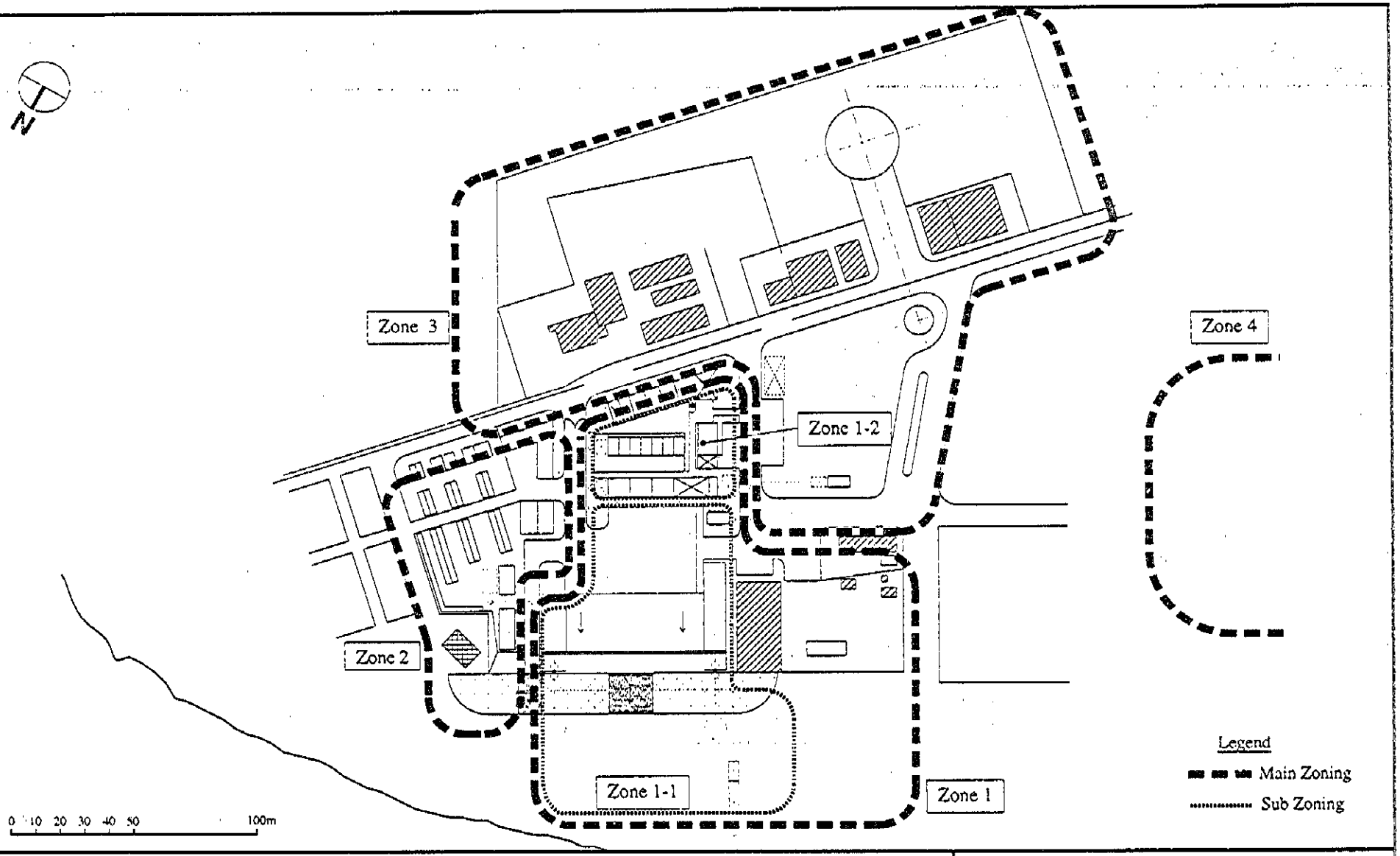


Fig. III.2.6-2 Layout Plan of Kayar Complex (Zone Plan)

THE STUDY ON THE DEVELOPMENT PROGRAM
FOR NORTHERN FISHING AREAS
IN THE REPUBLIC OF SENEGAL
JAPAN INTERNATIONAL COOPERATION AGENCY

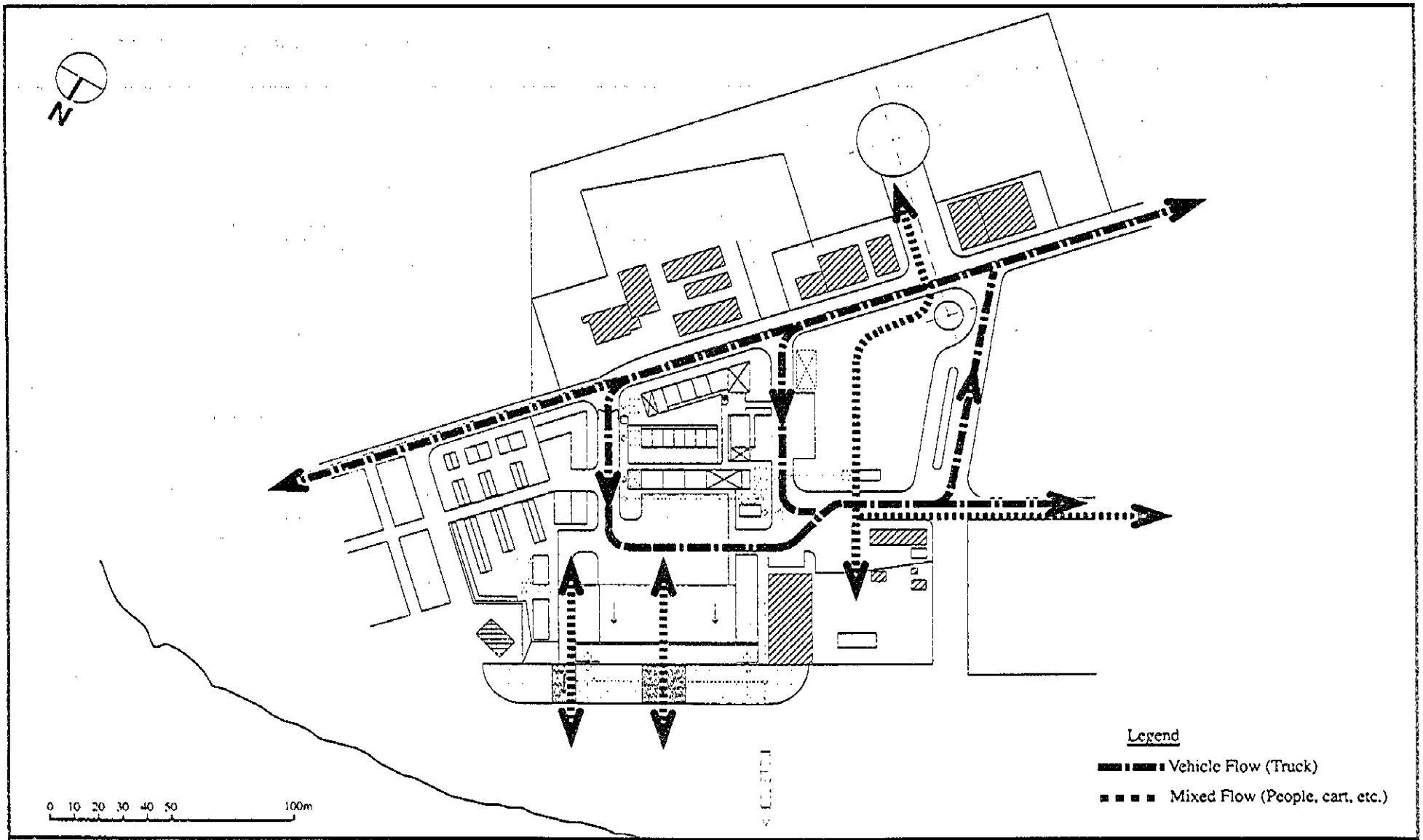


Fig. III.2.6-3 Layout Plan of Kayar Complex (Movement Plan)

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FOR NORTHERN FISHING AREAS
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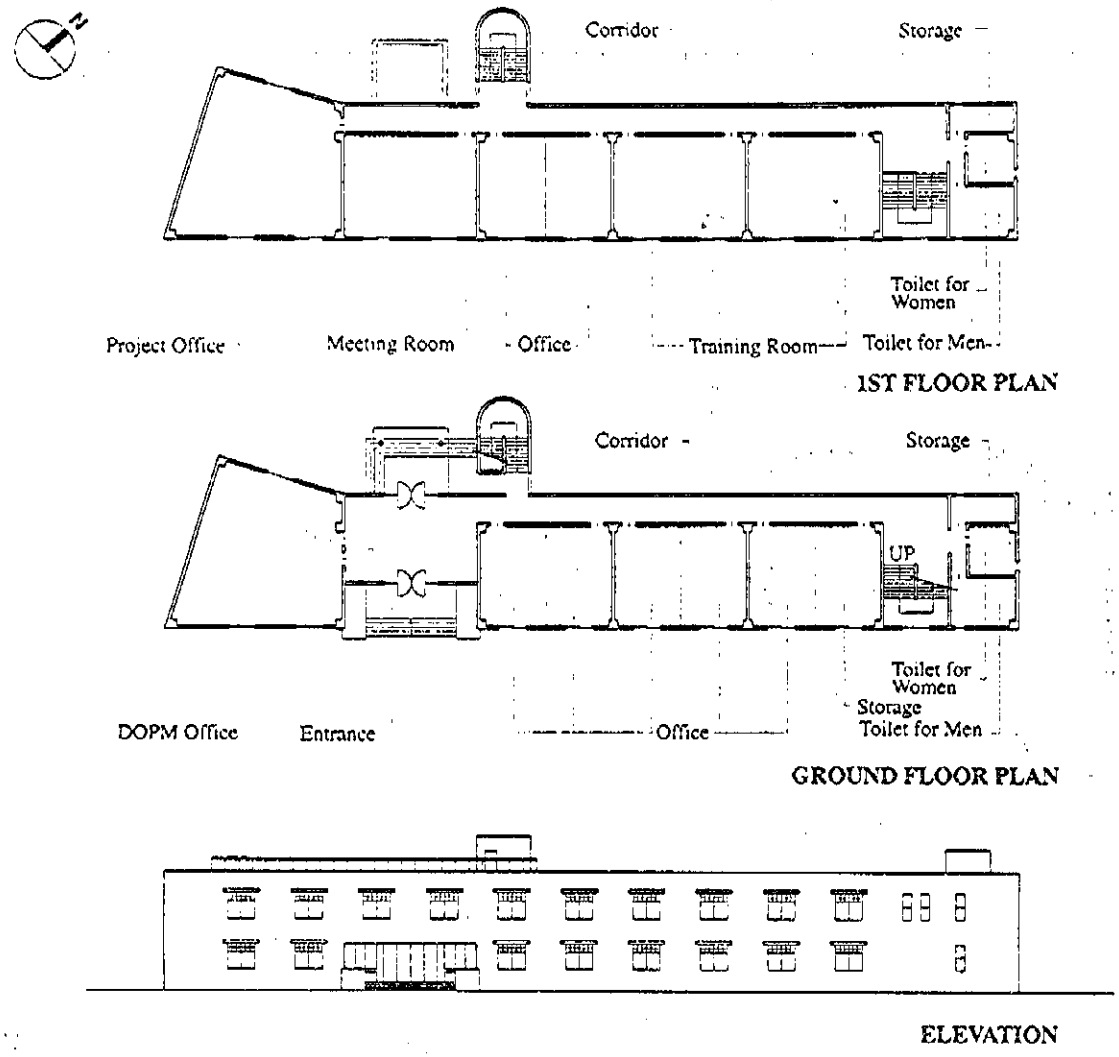

Fig. III.2.6-4 **Floor and Elevation Plan of Administration Building**

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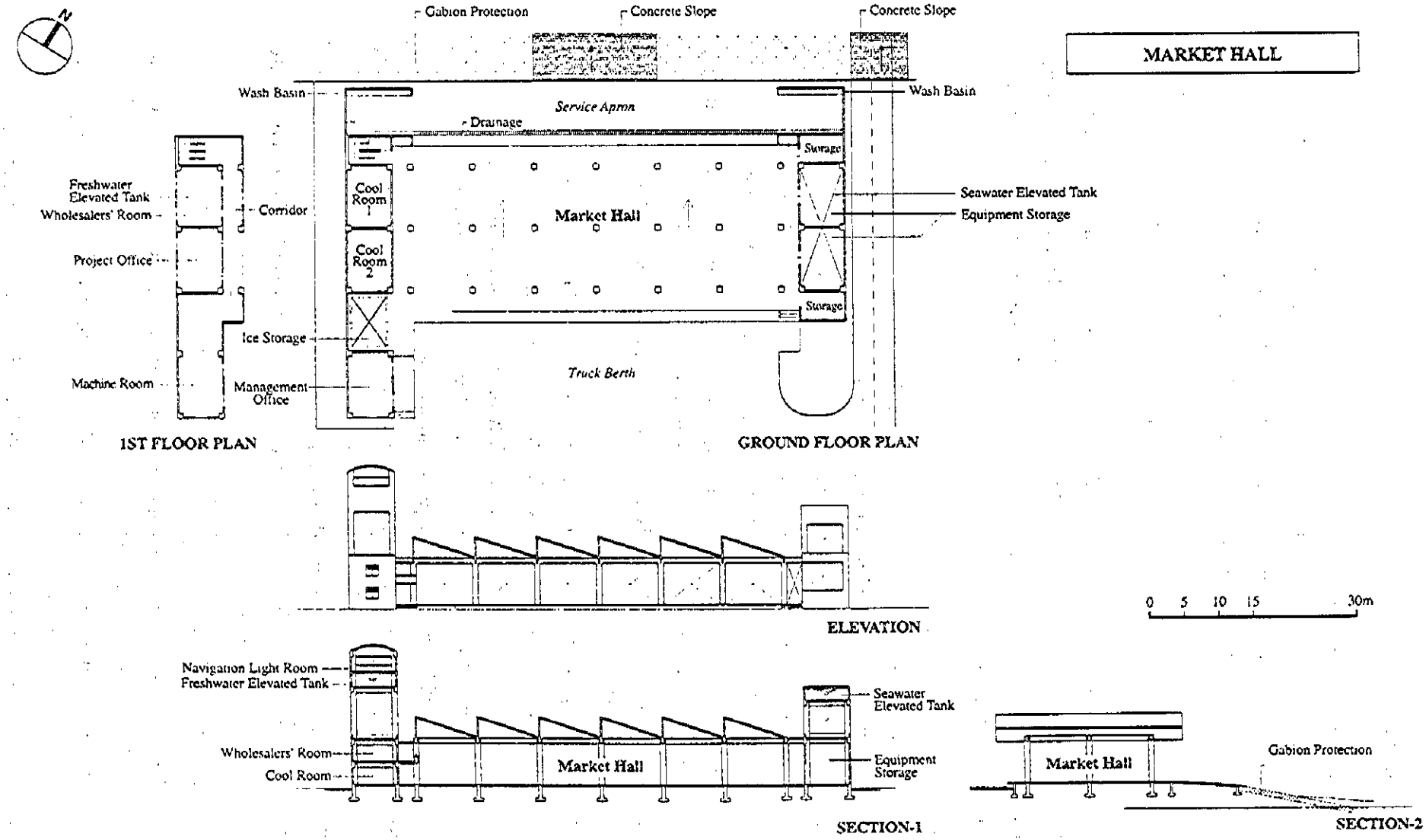

Fig. III.2.6-5 Floor and Elevation Plan of Market Hall

THE STUDY ON THE DEVELOPMENT PROGRAM
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IN THE REPUBLIC OF SENEGAL
JAPAN INTERNATIONAL COOPERATION AGENCY

2.7 Project Cost

(1) Costing Methodology

The local official monthly unit construction prices were obtained from Ministry of Public Works and Transport, Public Works Division (Ministére de l'Equipement et des Transports Terrestres, Direction des Travaux Publics) for types of facilities / structures similar to the project. These prices were analysed and compared with prices obtained from Control Bureau and local architects.

The unit prices compiled from the above analysis were then adjusted taking into account the type of material / finishing, construction method, design philosophy / concept, period of construction, and type of contract / procurement method that are applicable to the project.

(2) Costing Assumptions

1) The unit prices are constant prices as of July 1997.
2) Yearly price escalation is assumed to be 3 percent.
3) Physical contingency is assumed to be 5 percent to cover design contingencies/ changes, facilities / equipment that may become necessary but inadvertently left out of original design, unexpected site conditions, etc.
4) The unit prices are all inclusive prices i.e. it is assumed to include the necessary mobilization, construction, workmanship, supply, installations, etc.
5) Prices of imported materials and equipment are assumed to be tax exempted and CIF Dakar.
6) Land preparation i.e. levelling, demolition of existing buildings, removal of obstructions, relocation of existing houses or businesses, are not included in the unit prices and are the responsibility of the government of Senegal.
7) The standard of construction is of the level of foreign assisted projects in Senegal with the appropriate project management structure.
8) The construction period for each phase of construction is assumed to be one year from the time of contract signing.
9) Consultancy fee is assumed to be 8 percent of project cost.
10) Bureau de Controle consultancy fee, if necessary, shall be the responsibility of the Senegalese Government.

(3) Calculation Output

1) Sub-sector facilities and equipments unit costs were calculated and totalled to get the total sub-sector cost.
2) A summary of the sub-sectors' facilities and equipment costs was compiled in a cost summary for the zones.
3) The total cost of the project was compiled by adding all sub-sectors total cost.

Table III.2.7.1 Estimated Cost of Facilities and Equipment (Zone 2) (1/6)

	Facilities & Equipment	Zone 2 Kayar	Zone 2 Cost (FCFA)
SP1-1	**Navigation lights/sign, safety gear, office**		
Facilities	• Search light located at Elevated Water Tank tower	2 unit	4,583,000
	• Navigation lights (Flashing beacon). Solar powered type located at Elevated Water Tank tower	2 unit	6,417,000
	• Safety signal flag & flag pole	1 unit	2,292,000
		30 sq.m	9,167,000
	Sub-total Cost of Sub-Sector Facilities		22,458,000
Equipment	Center Equipment		
	• Security boat, FRP with float	1 unit	9,167,000
	- Outboard Engine with spare parts & reserve unit		
	• Broad-casting equipment	1 unit	4,583,000
	• Life preserver equipment		
	- Life jacket	100 no.	5,500,000
	- Life saving float with rope	10 no.	
	PSPS Reinforcement		
	• Reinstall existing equipment in center	1 unit	2,292,000
	Sub-total Cost of Sub-Sector Equipment		21,542,000
	Total Cost of Sub-Sector		**44,000,000**
SP1-2	**Model boat/gear**		
Equipment	• Experimental Training Boat & gear	1 unit	137,500,000
	- FRP boat, Diesel inboard engine		
	- Experimental fishing gear		
	- Transfer boat, FRP		
	• Training Boat with gear	10 unit	110,000,000
	- Senegal type boat (inboard engine type)		
	- Fishing gear		
	- Eco-sounder, GPS, compass		
	• Training Equipment		
	- Fishing gear	35 unit	40,104,000
	- GPS, compass	10 unit	11,458,000
	- Diesel engine	10 unit	68,750,000
	- Radio communication equipment	10 unit	9,167,000
	Total Cost of Sub-Sector		**376,979,000**
SP1-3	**Fishing Gear Storage**		
Facilities	• Storage type 1 (each unit = 10 sq.m)	20 unit	55,000,000
		200 sq.m	
	• Storage type 2 (each unit = 5 sq.m)	60 unit	82,500,000
		300 sq.m	
	• Work Area, wash basin, pavement	*500 sq.m*	34,375,000
	Sub-total of area =	*1000 sq.m*	
	Total Cost of Sub-Sector		**171,875,000**
SP1-4	**Workshop & Equipment**		
Facilities	• Workshop Building	1 unit	
	- Multipurpose yard	*100 sq.m*	6,875,000
	- Workshop	*100 sq.m*	27,500,000
	- Storage	*50 sq.m*	13,750,000
	- Office	*50 sq.m*	22,917,000
	Sub-total of areas =	*300 sq.m*	
	• Technical Service Shop	2 unit	18,333,000
	- Workshop & storage		
	• Fuel Service Station	1 unit	45,833,000
	- Diesel & Gasoline		
	Sub-total Cost of Sub-Sector Facilities		135,208,000
Equipment	• Workshop Equipment	1 unit	18,333,000
	- Engine maintenance tool		
	- Boat maintenance tool		

Table III.2.7.1 Estimated Cost of Facilities and Equipment (Zone 2) (2/6)

	Facilities & Equipment	Zone 2 Kayar	Zone 2 Cost (FCFA)
	- General maintenance tool		
	• Test Bench & tank	1 unit	2,292,000
	Sub-total Cost of Sub-Sector Equipment		20,625,000
	Total Cost of Sub-Sector		**155,833,000**
SP1-5	**Ship-building yard**		
Facilities	Building Yard with storage	1 unit	
	• Yard	*600 sq.m*	41,250,000
	• Storage	*50 sq.m*	13,750,000
	Sub-total Cost of Sub-Sector Facilities		55,000,000
Equipment	• Ship-building Equipment	1 unit	6,875,000
	Sub-total Cost of Sub-Sector Equipment		6,875,000
	Total Cost of Sub-Sector		**61,875,000**
SP1-6	**Service Apron**		
Facilities	• Concrete Paved Multipurpose Service space	1 unit	206,250,000
	- Paved area	*1,500 sq.m*	
	Total Cost of Sub-Sector		**206,250,000**
SP1-8	**Research Post**		
Facilities	• Research laboratory	1 unit	55,000,000
	Sub-total Cost of Sub-Sector Facilities		55,000,000
Equipment	• Research equipment	1 unit	18,333,000
	- Laboratory equipment		
	- Oceanographic Equipment		
	• Management & Statistics	1 unit	6,875,000
	- Computer		
	- Motorcycle, 175 cc x 2		
	Sub-total Cost of Sub-Sector Equipment		25,208,000
	Total Cost of Sub-Sector		**80,208,000**
SP1-9	**Sanitation facilities / equipment related to production**		
Facilities	• Unit 1 - Fishermen Gear Storage Area	1 unit	110,000,000
	- wash basin, toilet		
	• Unit 2 - Workshop Area	1 unit	36,667,000
	- wash basin, water reservoir, utility area		
	Total Cost of Sub-Sector		**146,667,000**
SP2-1	**Market Hall, Truck Berth, & Office**		
Facilities	Market Hall		
	• 1 cycle use of area (Nominal)	25 t/cycle	
	• Area	1,350 sq.m	618,750,000
	Truck Berth		183,333,000
	• Number of berthing truck	10 no.	
	• Number of waiting truck	6 no.	
	Cool Room (cool with ice), 1 ton/10 sq.m		
	• Stock Volume of Fresh Fish	12 ton	
	• Area	120 sq.m	55,000,000
	Office & Other Rooms		
	• Management office & Marketing room, Wholesaler's room	100 sq.m	55,000,000
	• Handling Equipment room	150 sq.m	41,250,000
	• Stairs & others	100 sq.m	27,500,000
	Sub-total of Office & Other Rooms =	*350 sq.m*	
	Total Area of Market Hall, Office & Other Rooms =	*1820 sq.m*	
	Sub-total Cost of Sub-Sector Facilities		980,833,000
Equipment	Fish Container Box		
	• Fish box, 50 kg/no.	350 no.	9,167,000
	Handling Equipment		
	• Weight measuring tool, 2 wheel cart, etc.	5 no.	4,583,000

Table III.2.7.1 Estimated Cost of Facilities and Equipment (Zone 2) (3/6)

	Facilities & Equipment	Zone 2 Kayar	Zone 2 Cost (FCFA)
	• Administrative equipment - information board, communication, P/A, telephone, etc., Office furniture	1 unit	13,750,000
	• Maintenance Equipment	1 unit	4,583,000
	• Fish box washing tank and high pressure washer	1 unit	13,750,000
	Sub-total Cost of Sub-Sector Equipment		45,833,000
	Total Cost of Sub-Sector		**1,026,667,000**
SP2-2	**Ice Plant & Cold Storage**		
Facilities	• Ice Plant building	200 sq.m	91,667,000
	• Ice making machine	10 ton/day *(5 ton x 2)*	137,500,000
	• Ice storage	20 ton	
	Sub-total Cost of Sub-Sector Facilities		229,167,000
Equipment	• Sorting & handling equipment - FRP Pan, 5 nos., 100 l / 50 l - Insulated box, 50 l, 5 nos. - Normal container box, 10 nos. - 2 wheel cart, measuring tools - 2 nos.	1 unit	3,438,000
	• Maintenance Equipment - tools, etc.	1 unit	458,000
	Sub-total Cost of Sub-Sector Equipment		3,896,000
	Total Cost of Sub-Sector		**233,063,000**
SP2-4	**Storage for Processed Fish**		
Facilities	• Storage	100 sq.m	27,500,000
	Sub-total Cost of Sub-Sector Facilities		27,500,000
Equipment	• Wooden shelf, palette	1 unit	6,875,000
	Sub-total Cost of Sub-Sector Equipment		6,875,000
	Total Cost of Sub-Sector		**34,375,000**
SP2-5	**Sanitation facilities / equipment related to marketing**		
Facilities	• Sanitation Unit - 1 - Wash basin, toilets, shower, etc.* same as SP1-9	1 unit	110,000,000
	• Sanitation Unit - 2 - Wastewater screen & semi-treatment system	1 unit	68,750,000
	Sub-total Cost of Sub-Sector Facilities		178,750,000
Equipment	• Cleaning & Garbage collection equipment - Cleaning tools - Garbage collection bins, 10 nos - Garbage trailer, 1 no.	1 unit	1,375,000
	Sub-total Cost of Sub-Sector Equipment		1,375,000
	Total Cost of Sub-Sector		**180,125,000**
SP3-1	**Model Artisanal Processing Area**		
Facilities	• Preparation Area for Processing - concrete paved with discharge ditch & pit, but without shed	1,000 sq.m	91,667,000
	• Processing tank area - Cleaning tank - Treatment table & tank - Salting area	500 sq.m	68,750,000
	• Rest Building - with roof but no wall	200 sq.m	55,000,000
	• Changing / Wash Building - shower & wash basin	30 sq.m	20,625,000
	• Drying Area - Concrete paved, drainage ditch & pits, road between processsing zone	4,500 sq.m	206,250,000
	• Smoking Area - Access route : pavement, drainage ditch & pits, ovens	1,500 sq.m	68,750,000
	• Product & Material Storage, & Office Building - Product storage room, tool storage room, office & meeting room	200 sq.m	55,000,000
	• Fermentation Area	200 sq.m	9,167,000

Table III.2.7.1 Estimated Cost of Facilities and Equipment (Zone 2) (4/6)

	Facilities & Equipment	Zone 2 Kayar	Zone 2 Cost (FCFA)
	Sub-total Cost of Sub-Sector Facilities		575,208,000
Equipment	• Processing Area Equipment	1 unit	22,917,000
	- Wooden drying table with net, work table, handling cart, scale, plastic tank, other local toos		
	• Processing improvement unit - available for rental & training	50 unit	45,833,000
	Sub-total Cost of Sub-Sector Equipment		68,750,000
	Total Cost of Sub-Sector		**643,958,000**
SP3-2	**Export Promotion Services**		
Facilities	• Sorting & Packing area	160 sq.m	73,333,000
	• Management office		
	Sub-total Cost of Sub-Sector Facilities		73,333,000
Equipment	• Sorting & Packaging Equipment	1 unit	16,042,000
	- Packing table, packing machine		
	- 2 wheel cart, measuring tools - 2 nos.		
	- Stainless sink, stainless table		
	- Chest freezer, 500 l - 2 nos..		
	• Administrative equipment	1 unit	4,583,000
	- Information board, telephone, office furniture.		
	Sub-total Cost of Sub-Sector Equipment		20,625,000
	Total Cost of Sub-Sector		**93,958,000**
SP3-3	**Quality Control Laboratory & Equipment**		
Facilities	• Quality Inspection facilities	50 sq.m	34,375,000
	- Inspection room, test & maintenance room, storage, office		
	• Laboratory Equipment	1 unit	9,167,000
	- Quality test equipment, control & study equipment, filing equipment, office furniture		
	Total Cost of Sub-Sector		**43,542,000**
SP3-4	**Sanitation facilities / equipment related to processing**		
Facilities	• Sanitary Unit - A	1 unit	110,000,000
	- Toilet & shower room unit, * same as SP1-9		
	• Sanitary Unit - B	1 unit	4,583,000
	- Garbage collection yard		
	Sub-total Cost of Sub-Sector Facilities		114,583,000
Equipment	• Garbage collection & cleaning support equipment	2 unit	1,833,000
	- Garbage collection bins (10 nos), cleaning tools, trailer for garbage bins (2 nos)		
	Sub-total Cost of Sub-Sector Equipment		1,833,000
	Total Cost of Sub-Sector		**116,417,000**
SP4-1	**Facilities / equipment for Retail Market**		
	Rehabilition / Extension of the Retail Market		
Facilities	• Extension of the retail market (Market hall area for existing retailers at the project area)	*Key facilities only*	91,667,000
	Sub-total Cost of Sub-Sector Facilities		91,667,000
Equipment	Market activities supporting equipment	1 unit	4,583,000
	Sub-total Cost of Sub-Sector Equipment		4,583,000
	Total Cost of Sub-Sector		**96,250,000**
SP4-2	**Basic infrastructure/services**		
	For Community		
Facilities	Extension of the existing primary school		
	• Construction of class room	2 no.	45,833,000
	• Support of Sport Field (football, basketball)	1 unit	9,167,000
Equipment	Equipment for Primary School & sport support		
	• Black board, desk & chair, locker, etc. for class room	for 2 class room unit	4,583,000
Facilities	Rehabilitation of the existing health post		

Table III.2.7.1 Estimated Cost of Facilities and Equipment (Zone 2) (5/6)

	Facilities & Equipment	Zone 2 Kayar	Zone 2 Cost (FCFA)
	• Rehabilitation of the building & M&E works	1 unit	4,583,000
Equipment	Equipment for health post related		
	• Health post equipment & movable equipment for public health training	1 unit	4,583,000
Facilities	Sanitation Support Facilities	1 unit	
	• Toilet unit, *same as SP1-9		91,667,000
	• Treatment system & garbage collection area		4,583,000
Equipment	• Sanitation Support Equipment	1 unit	917,000
	- Cleaning equipment		
	- Garbage collection equipment (hand cart, garbage collection bins, etc.		
	Sub-total Cost of Sub-Sector Facilities		155,833,000
	Sub-total Cost of Sub-Sector Equipment		10,083,000
	Total Cost of Sub-Sector		**165,917,000**
	For Complex		
Facilities	**For Kayar**		
	• Water supply for the complex and some community village area	1 unit	550,000,000
	• Shallow well construction and/or improvement	1 unit	5,500,000
	• Rehabilitation & construction of the service road	2 km	137,500,000
	- Kayar, approx. 2 km (0.5 km + 1.5 km)		
	Sub-total Cost of Sub-Sector Facilities		693,000,000
Equipment	• Garbage Collection System support	3 unit	3,438,000
	- Garbage collection area, equipment		
	• Drainage System Support Equipment	3 unit	2,750,000
	- Hume pipe, L = 7 m, excavation tools, etc.		
	Sub-total Cost of Sub-Sector Equipment		6,188,000
	Total Cost of Sub-Sector		**699,188,000**
SP5	**General Education & Training Facilities & Equipment**		
Facilities	OJT Training Center		
	• OJT Training Facility Floor area	120 sq.m	55,000,000
	- office, storage, training room, etc		
	Sub-total Cost of Sub-Sector Facilities		55,000,000
Equipment	• OJT Training Equipment	1 unit	11,458,000
	- General equipment : OHP, black board, chair, table, video		
	– OJT Training Equipment : security, boat engine, fishing gear, sanitation, processing, etc.		
	Sub-total Cost of Sub-Sector Equipment		11,458,000
Facilities	Dormitory		
	• Operation Staff Dormitory - 1 : (8 x 6 = 48 sq.m)	2 unit	32,083,000
	• Trainee Dormitory - 2 : (8 x 4.5 = 36 sq.m)	3 unit	34,375,000
	• Sanitation Unit (toilet/shower/utility)	1 unit	11,458,000
	Sub-total Cost of Sub-Sector Facilities		77,917,000
Equipment	• Service / Maintenance Equipment	1 unit	917,000
	Sub-total Cost of Sub-Sector Equipment		917,000
	Total Cost of Sub-Sector		**145,292,000**
SP6	**Administration & monitoring equipment**		
Facilities	• Administration / Monitoring Facilities	550 sq.m	252,083,000
	- Management office (with storage), GIE groups' office, Credit office, Storage, DOPM / CRODT / PSPS / Others		
	Sub-total Cost of Sub-Sector Facilities		252,083,000
Equipment	• Administrative Equipment	1 unit	9,167,000
	- Statistics & Monitoring equipment: computer, O / A equipment: copy, etc., Office furniture		
	Activities Support Equipment		
	• Pick up truck:4 WD double cab, 1.5 ton	2 no.	16,042,000

Table III.2.7.1 Estimated Cost of Facilities and Equipment (Zone 2) (6/6)

	Facilities & Equipment	Zone 2 Kayar	Zone 2 Cost (FCFA)
	• Truck:3.5 ton		
	• Motor cycle	2 no.	3,208,000
	• Bicycle	2 no.	275,000
	Sub-total Cost of Sub-Sector Equipment		28,692,000
Facilities	• Canteen	120 sq.m	38,958,000
	- Kitchen, storage, hall, utility		
	Sub-total Cost of Sub-Sector Facilities		38,958,000
Equipment	• Canteen Equipment	1 unit	9,167,000
	- Chest freezer, kitchen ware, table / chair, maintenance / cleaning equipment		
	Sub-total Cost of Sub-Sector Equipment		9,167,000
	Total Cost of Sub-Sector		**328,900,000**
SP7	**Miscellaneous Support Facilities & Equipment**		
Facilities	• Fresh Water Supply System for the facilities of the Complex	1 unit	137,500,000
	- Water reservoir, elevated water tank, supply system		
	• Well water supply system for the Market Hall & Fishermen's Storage area	1 unit	82,500,000
	- Well, Elevated water tank, supply system		
	• Transformer & Electricity Distribution facilities	1 unit	68,750,000
	• Sanitary & Waste Water Treatment system	1 unit	183,333,000
	• External Work	1 unit	91,667,000
	- Land reclamation, external pavement, ditch, pits, external lighting, landscaping, others		
	Sub-total Cost of Sub-Sector Facilities		563,750,000
Equipment	• Fire-Fighting System	1 unit	3,667,000
	• Lightning protection	1 unit	9,167,000
	• First Aid	1 unit	1,375,000
	Sub-total Cost of Sub-Sector Equipment		14,208,000
	Total Cost of Sub-Sector		**577,958,000**
	Total Cost of All Sector's Facilities		4,943,582,000
	Total Cost of All Sector's Equipment		685,712,000
	Grand Total Cost of All Sector (Facil + Equipment)		5,629,294,000
	Consultancy Fee (8%)		450,343,520
	Physical Contingencies (5%)		281,464,700
	Price Escalation (3%) for construction to start 1998		168,878,820
	Total Cost of Project		**6,529,981,000**

2.8 Project Evaluation

2.8.1 Economic Evaluation

The objective of the economic analysis is to study and appraise the economic feasibility of the Kayar project in the target year (2010) from the view point of national economy. The purpose of this analysis is to investigate economic benefits and costs that will arise from this project. An economic internal rate of return (EIRR) based on a cost-benefit analysis is used to appraise the feasibility of the project by comparing the case with the project and without the project implementation. The following assumptions have been considered for the Kayar Project.

	With Project	Without Project
Time cost saving 1) Landing & marketing	Organized landing at the complex and collection depot	Scattered landings along 1.5 km beach and disorganized
2) Collection of fish by wholesalers	1) Organized collection of fish under one roof 2) Reduce duration in collection and transfer of fish truck and proper storage facilities available.	1) Scattered collections by collectors and wholesalers 2) Long duration in collection of fish under open sun and transfer and storage without proper facilities
3) Truck trip saving (for high price fish - HPF, based on order of fish export companies in Dakar)	1) Organized collection of fish enable wholesalers to store the fish using the adequate ice and cool storage provided in the project. 3) A truck of 2 to 2.5 tons can get supplied in one day.	1) Fishermen may not be able to fulfill the quantity ordered by fish traders as there are no adequate storage facilities. 2) A truck of 2 to 2,5 tons cannot get supplied in one day. 3) The truck has to make another trip the next day to get the remainder of the ordered supply.
4) Quality loss (HPF)	1) With concentrated and organized landing and collection at the complex and the collection depots, and with the adequate facilities and training provided, about 50% of quality loss can be reduced.	1) Landed fish (sorted by species but mixed size) with little ice are transferred to scattered collection points. 2) Collection points are back alleys, road sides, etc. and are usually open and dirty, where the fish are again sorted, iced and packed to transport. 3) Under the above circumstances fish quality is reduced, and the acceptable quantity for export is reduced. About 7% of the quantity taken to Dakar are not accepted for export.
5) Reduction of processed fish loss during storage	1) With the proper storage facilities provided in the project the 5% loss can be saved.	1) As there are no proper storage facilities for processed fish, the product is stored in open spaces and exposed to rain and sand, and vermin, etc. 2) Under the above conditions, the processors lose about 5% of their products prior to marketing.

Investment fund

It is assumed that the project cost is funded by the government.

Physical life of the project

The physical life of the project components is shown in Table III.2.8-3.

Prices and foreign exchange rate

All costs and benefits are based on constant price of 1997. Foreign exchange rates of 550 FCFA to a US dollar and Japanese Yen 120 to a US dollar are used.

Income tax

Income tax is assumed to be not levied against revenues.

(1) Project Economic Cost

The investment (financial) costs of the Kayar Project and its detail components are shown in Table III.2.8-3. The financial cost of the project is converted to economic cost by applying the economic conversion factor of 0.75 provided by the regional world bank office. Transfer costs within the national economy, such as interest, insurance and tax are excluded from the economic cost. The financial and economic cost are shown in Table III.2.8-1 The operational cost that includes personnel, utility, repair and maintenance and administration cost are shown in Table III.2.8-2.

(3) Economic Benefits

Time cost saving : Savings in opportunity costs due to reduction in number of truck trips

Collection of sufficient quantity of high price fish takes long duration in terms of days. Fish exporting firms in Dakar function on orders from consumption markets in Europe and availability of space in cargo planes. In order to meet a deadline, these firms have regular collectors and wholesalers in the production area to supply a certain quantity of fish by a certain time, and these orders are given to fishermen. Under the existing conditions (or without the project), if the wholesalers are not able to supply the required quantity on the day the truck arrives, the truck will leave with the available quantity and will make another trip the next day. A collection of two to three tons of fish may take one or more days. In other words, the truck sent from Dakar has to travel back with the inadequate quantity, and make another trip the next day for the rest of the fish. If the project is implemented, there will be adequate facilities for organized landings and collection, and storage facilities that will enable the wholesalers to instruct fishermen to go fishing without having to wait for orders

from Dakar and fulfill the immediate order from Dakar. The truck from Dakar would be able to pick up sufficient quantity in one trip, and thus save one truck trip.

The estimated volume of high price fish in the year 2010 is about 3,543 tons. Without the project, it would take about 2,362 trips a year (truck carrying 1.5 tons per trip); with the project, the number of truck trips is about 1,181 (trucks carrying 3 tons per trip). In monetary terms, the savings would be FCFA 35.43 million (one round trip between Dakar and Kayar is about FCFA 30,000) in 2010 and it was about FCFA 24.3 million in 1995.

The number of truck trips saved also saves the fuel consumption. A round trip of a truck between Kayar and Dakar consumes about 20 liters of diesel. With the 1,181 trips saved in 2010, an estimated total of 23,620 liters of fuel could be saved. In monetary terms, the fuel savings (at FCFA 200/liter) would be FCFA 4.724 million in 2010 and FCFA 3.24 million in 1995.

Reduction in quality loss of high price fish

Wholesalers and collectors keep their purchased high price fish in boxes at collection points that are located in open sheds or at home with no proper facilities and wait for the trucks from Dakar and the accumulation of a sufficient quantity. Sometimes the waiting can be two to three days; during this time there is quality loss which is estimated to be about five percent. When the fish is delivered at the fish processing factories in Dakar, another two percent were observed to be unacceptable for export. Therefore, about 7 percent of quality loss in high price fish was noticed without the project. In the case of with the project, there will be a training program for wholesalers on fish handling, and also adequate storage facilities will be available for use by wholesalers; and quality loss is expected to be reduced to about 50 percent.

The estimated volume of high price fish in the year 2010 is about 3,543 tons; of which about 1,594 (50%) are expected to be exported. Without the project, quality loss of about 112 tons are anticipated to be unacceptable for export; and about 55 tons could be saved for export with the project. In monetary terms, it will be about FCFA 82.5 million in 2010 and it was about 57 million in 1995.

Increased fish catch

The volume of fish landed in 1995 was 16,898 tons and it is projected to increase to about 18,080 tons in 2010 with limited fisheries resources in the Senegalese coastal waters and without any modernized fishing. With the introduction of modernized fishing and training, and fishing further from the existing fishing grounds, the fish landing is projected to increase by about 1,220 tons, amounting to a total landing of 19,300 tons in 2010. In view of an increased population and decrease

in the per capita consumption, an increase of 1,220 tons could contribute to the fish consumption supply and source of protein. In monetary terms it is estimated to be about FCFA 242.4 million.

Reduction in storage loss of processed fish

Approximately about 4,936 tons (29%) of total fish landed in Kayar were processed. These processed product are stored in open space without shelters and storage facilities; and thus exposed to rain, sand and vermin till the marketing. Under these conditions, a loss of 5 to 10 percent is anticipated. In 2010, about 6,855 tons are estimated to be processed; without the project, a loss of about 343 tons to 686 tons are anticipated. If the project is implemented, there will be adequate storage facilities for use by the processors, and these losses can be avoided. In monetary terms (at FCFA 58/kg of fish), the savings would be FCFA 19.894 million in 2010 and FCFA 14.326 million in 1995)

Other benefits

The other benefits listed below cannot be quantified, and calculation is not attempted in this study.

- Improved safety in the landing
- Saving of lives through safety facilities
- Timely and better quality repair through workshop and availability of spareparts
- Resource management will maintain sustainable production of fish
- Development of related industries

(4) Results of the Economic Evaluation

The EIRR shows a minus 5 percent for the project; if all sectors are included in this project, the social welfare aspects must be emphasized rather than economic development. If the focus is placed on improving the fisheries industry by targeting only the two highest revenue generating sectors, (improving fish production, fish marketing and distribution), the internal economic profit earning efficiency will improve. The EIRR for these two sector is a plus 5 percent. But the economic activities of this type of project is also more suited and effective as a social welfare project. It is particularly suited to receive overseas financial assistance as a project which will help resolve the national issue regarding the scattered residency of transmigrant fishermen, etc.

2.8.2 Financial Evaluation

The objective of this evaluation is to study and appraise the financial feasibility of the Kayar project in the target year (2010). The profitability of the projects is analyzed using the financial rate of return (FIRR). The FIRR is a discount rate that makes net present value of cash flow (revenue - costs) during the project life equal to be zero. The following conditions are assumed for the calculation.

Investment fund

It is assumed that the project cost is funded by the government.

Physical life of the project

The physical life of the project components is shown in Table III.2.8-3.

Prices and foreign exchange rate

All costs and benefits are based on constant price of 1997. Foreign exchange rates of FCFA 550 to a US dollar and Japanese Yen 120 to a US dollar are used.

(1) Project Financial Cost

Investment cost

The investment costs of the Kayar Project and its its detail components are shown in Table III.2.8-3.

Operation cost

The annual operation costs are assumed as follows and the detail are shown in Table III.2.8-2. The annual personnel cost are estimated based on the organization proposed for the both the projects. Personnel cost and the number of staff members are shown in Table III.2.8-4. The utility cost covers mainly for electricity and water, and most of the utility cost is accrued in the operation of market hall, ice making and cool storage of the sector 2. The annual repair and maintenance costs are assumed from one percent to five percent depending on the facilities and equipment of the investment cost. The administration cost is assumed to be 20 percent of the personnel cost.

The annual depreciation costs of the facilities and equipment (Table III.2.8-4) are calculated by the straight line method on the depreciation lives. Generally the depreciation lives of 20 years for buildings and structures, and from 5 to 10 years for equipment.

(2) Revenue of the Project

The revenue generated in the project is shown in Table III.2.8-5; some of the revenues are estimated based on the present users charges in Joal Fisheries Center and Dakar Central Fish Market, and for those where there no available case of charges, the users charge is based on rental use. The rental use is calculated based on the depreciation and maintenance cost of the facilities and equipment. The revenue will arise from the following items. The total revenue accured in the first year is about FCFA 350 million; of which FCFA 250 million (72%) is from sector 1 and FCFA 85 million (24%) is from sector 2.

1) Annual registratton fee of wholeslaers using the complex
2) Daily user charges for wholesalers
3) Entrance charge for fish trucks
4) Sales and crushing of ice
5) Rental of cool storage
6) Rental of processed fish storage
7) Rental of fish box
8) Rental of wholesale room
9) Rental of fishing gear storage
10) Rental of boatyard and workshop

(3) Results of the Financial Evaluation

The income statement and the cash flow of the Kayar Project and the revenue earning sectors of the project are shown in Tables III.2.8-6 and III.2.8-7, respectively. In both cases the operational expense can be recovered before the depreciation. The income after depreciation borders on the red throughout the life of project when all the components are considered. However, in case of revenue earning components, the income after depreciation is in the black from the 8th year.

The FIRR indicated a minus 24 percent when all the sectors are considered and also a minus 16 percent for the three revenue earning sectors. Even in the case of a 20 percent down sizing of the investment cost, the FIRR is a minus 13 percent for the project and also a minus 13 percent also for the three main revenue earning sectors. However, at a 80 percent reduction, assuming the project is financed under a grant aid, the FIRR is a plus 10 percent for the three revenue earning sectors but a minus 2 percent when all the sectors are considered. Under these circumstances, the scope of the facilities and equipment has to be taken into consideration when reducing the scope of the project.

If depreciation costs are not considered, the project will be in sound financial condition after a certain period of time. If depreciation costs are included, the scope of

the project must be reduced. As revenue is anticipated from sectors 1 and 2, the project will be feasible if these sectors alone are targeted and the salaries of the project management body are paid by the national government.

A financial analysis of the ice plant (Table III.2.8-8), which is one of the major sources of revenue, shows a profit of about 10 million FCFA before depreciation in the first year, and about FCFA 723,000 after depreciation.

2.8.3 Other Benefits

Other benefits that are anticipated as indirect benefits or intangible benefits that are not accounted for in the economic or financial analysis are summarized below:

(1) Relocation of Local Retail Market

The relocation of the existing local retail market to a new location with better facilities will benefit both the retailers and consumers in terms of improved sanitation, shelter from the elements, water, electricity, and toilet services. The organization of the new retail market will lead to a more efficient flow of people and products and better integration with the traffic transport system.

(2) Reduced Risk of Epidemic and Diseases

The complex's sorting, storage, marketing, processing and distribution activities in a more sanitary and clean environment will improve the quality and cleanliness of the fisheries product that will subsequently:

- Reduce the cost of worker and consumer health care
- Reduce the risk of epidemic and the spread of diseases due to a dirty / unhygienic environment and fisheries product
- Reduce the time lost due to sick workers and consumers
- Produce a more hygienic product and increase value added processed fisheries products

(3) Increase in Tourism Income

The potential for tourism in the area will increase as a consequence of improved sanitation and environment. With the elimination of the bad odor, flies and unsightly / unsanitary conditions in the fishing community, tourism activities will be promoted and this could lead to more hotels being built and related job opportunities increase.

(4) Spin-off Economic Activities

The increase economic activities in the area due to the complex and new retail market will encourage spin-off activities such as restaurants, transport services, hotels, sundry stores, etc. These spin-off activities will create more job opportunities and improve job security for the inhabitants.

(5) Increased Enrollment Rate of Primary School Students

An improved awareness of community members on the importance of primary education and expansion of the primary school will contribute to an increase in primary school enrollment rate in the fishing communities.

Table III.2.8-1 Financial and Economic Cost of Kayar Project

Unit : 1000 FCFA

	Facilities & Equipment	Financial Cost	Economic Cost
SP1-1	Navigation lights/sign, safety gear, office	44,000	33,000
SP1-2	Model boat/gear	376,979	282,734
SP1-3	Fishing Gear Storage	171,875	128,906
SP1-4	Workshop & Equipment	155,833	116,875
SP1-5	Ship-building yard	61,875	46,406
SP1-6	Service Apron	206,250	154,688
SP1-7	Service Facilities for Riverside	-	0
SP1-8	Research Post	80,208	60,156
SP1-9	Sanitation facilities / equipment related to production	146,667	110,000
SP2-1	Market Hall, Truck Berth, & Office	1,026,667	770,000
SP2-2	Ice Plant & Cold Storage	233,063	174,797
SP2-3	Fish Collection Depot	-	0
SP2-4	Storage for Processed Fish	34,375	25,781
SP2-5	Sanitation facilities / equipment related to marketing	180,125	135,094
SP3-1	Model Artisanal Processing Area	643,958	482,969
SP3-2	Export Promotion Services	93,958	70,469
SP3-3	Quality Control Laboratory & Equipment	43,542	32,657
SP3-4	Sanitation facilities / equipment related to processing	116,417	87,313
SP4-1	Facilities / equipment for Retail Market	96,250	72,188
SP4-2	Basic infrastructure/services	-	
	For Community	165,917	124,438
	For Complex	699,188	524,391
SP5	General Education & Training Facilities & Equipment	55,000	41,250
SP6	Administration & monitoring equipment	328,900	246,675
SP7	Miscellaneous Support Facilities & Equipment	577,958	433,469
	Cost of Project	5,539,005	4,154,254
	Consultancy Fee (8%)	443,120	332,340
	Physical Contingencies (5%)	276,950	207,713
	Price Escalation (3%) for construction to start 1998	166,170	124,628
	Re-Mobilization cost (5%) for 2 phase construction	-	-
	Total Cost of Project (FCFA)	6,425,246	4,818,934

Remarks 1) Constant price of 1997
2) Conversion factor of 0.75 is used for economic cost.

Table III.2.8-2 Annual Operation Cost of Kayar Project

Unit: 1000 FCFA

	Kayar		Total
	1999	2000	
Maintenance			
Sector 1	4,079	17,932	22,011
Sector 2	17,061	-	17,061
Sector 3	435	9,235	9,670
Sector 4	7,239	3,117	10,356
Sector 5	-	1,948	1,948
Sector 6	3,382	645	4,026
Miscell. facilities & equipment	6,064	-	6,064
Sub-total	38,261	32,876	71,137
Salary			
Director (General Manager)	-	4,200	4,200
Sector -1 (Division 1) Fish Res & Prod	-	10,200	10,200
Sector -2 (Division 2) Fish Marketing	-	13,800	13,800
Sector -3 (Division 3) Fish Proc&Quality	-	10,200	10,200
Sectors 4,5,&6 (Division 4) Admin?Finan.	-	17,760	17,760
Sub-total	-	56,160	56,160
Administrative/Managment cost (20%)	11,232	11,232	11,232
Utility			
Electricity	-	36,156	36,156
Water	-	9,105	9,105
Sub-total	-	45,261	45,261
Depreciation			
Sector 1	15,317	62,109	78,425
Sector 2	60,645	-	60,645
Sector 3	1,742	16,576	18,318
Sector 4	28,133	10,878	39,010
Sector 5	-	6,142	6,142
Sector 6	15,822	2,475	18,297
Miscell. facilities & equipment	25,392	-	25,392
Sub-total	148,049	98,179	246,229
TOTAL	197,542	243,709	430,019

Remarks : Administrative and managment cost estimate at 20 percent of salary.

Table III.2.8-3 Project Cost and Physical Life by Components of Kayar Project

Unit: FCFA

	Facilities & Equipment	Life	Kayar Zone 2 Total cost	1999 Phase 1 a	2000 Phase 1 b	1999 (Phase 1a)		2000 (Phase 1b)	
				Investment Cost		Depreciation	Maintenance	Depreciation	Maintenance
SECTOR - 1									
SP1-1	Navigation lights/sign, safety gear, office								
Facilities		25	22,458,333	-	22,458,333	-	-	898,333	224,583
Equipment		10	21,541,667	-	21,541,667	-	-	2,154,167	646,250
	Total Cost of Sub-Sector		44,000,000	-	44,000,000	-	-	3,052,500	870,833
SP1-2	Model boat/gear								
Equipment		10	376,979,167	-	376,979,167	-	-	37,697,917	11,309,375
SP1-3	Fishing Gear Storage								
Facilities		25	171,875,000	-	171,875,000	-	-	6,875,000	1,718,750
SP1-4	Workshop & Equipment								
Facilities		25	135,208,333	-	135,208,333	-	-	5,408,333	1,352,083
Equipment		15	20,625,000	-	20,625,000	-	-	1,375,000	1,031,250
	Total Cost of Sub-Sector		155,833,333	-	155,833,333	-	-	6,783,333	2,383,333
SP1-5	Boat-building yard								
Facilities		25	55,000,000	-	55,000,000	-	-	2,200,000	550,000
Equipment		15	6,875,000	-	6,875,000	-	-	458,333	343,750
	Total Cost of Sub-Sector		61,875,000	-	61,875,000	-	-	2,658,333	893,750
SP1-6	Service Apron								
Facilities	Total Cost of Sub-Sector	25	206,250,000	206,250,000	-	8,250,000	2,062,500	-	-
SP1-7	Service Facilities for Riverside								
Facilities	Total Cost of Sub-Sector	25	-	-	-	-	-	-	-
SP1-8	Research Post								
Facilities		25	55,000,000	55,000,000	-	2,200,000	550,000	-	-
Equipment		5	25,208,333	-	25,208,333	-	-	5,041,667	756,250
	Total Cost of Sub-Sector		80,208,333	55,000,000	25,208,333	2,200,000	550,000	5,041,667	756,250
SP1-9	Sanitation facilities/equip.								
Facilities	Total Cost of Sub-Sector	25	146,666,667	146,666,667	-	5,866,667	1,466,667	-	-
TOTAL OF SECTOR - 1									
	Facilities		792,458,333	407,916,667	384,541,667	16,316,667	4,079,167	15,381,667	3,845,417
	Equipment		451,229,167	-	451,229,167	-	-	46,727,083	14,086,875
	Total		1,243,687,500	407,916,667	835,770,833	16,316,667	4,079,167	62,108,750	17,932,292
SECTOR - 2									
SP2-1	Market Hall, Truck Park, & Office								
Facilities		25	980,833,333	980,833,333	-	39,233,333	9,808,333	-	-
Equipment		15	45,833,333	45,833,333	-	3,055,556	2,291,667	-	-
	Total Cost of Sub-Sector		1,026,666,667	1,026,666,667	-	42,288,889	12,100,000	-	-
SP2-2	Ice Plant & Cold Storage								
Facilities		25	229,166,667	229,166,667	-	9,166,667	2,291,667	-	-
Equipment		10	3,895,833	3,895,833	-	389,583	194,792	-	-
	Total Cost of Sub-Sector		233,062,500	233,062,500	-	9,556,250	2,486,458	-	-
SP2-3	Fish Collection Depot								
Facilities		25	-	-	-	-	-	-	-
Equipment		15	-	-	-	-	-	-	-
	Total Cost of Sub-Sector		-	-	-	-	-	-	-
SP2-4	Storage for Processed Fish								
Facilities		25	27,500,000	27,500,000	-	1,100,000	275,000	-	-
Equipment		15	6,875,000	6,875,000	-	458,333	343,750	-	-
	Total Cost of Sub-Sector		34,375,000	34,375,000	-	1,558,333	618,750	-	-
SP2-5	Sanitation facilities / equipment								
Facilities		25	178,750,000	178,750,000	-	7,150,000	1,787,500	-	-
Equipment		15	1,375,000	1,375,000	-	91,667	68,750	-	-
	Total Cost of Sub-Sector		180,125,000	180,125,000	-	7,241,667	1,856,250	-	-
TOTAL OF SECTOR - 2									
	Facilities		1,416,250,000	1,416,250,000	-	56,650,000	14,162,500	-	-
	Equipment		57,979,167	57,979,167	-	3,995,139	2,898,958	-	-
	Total		1,474,229,167	1,474,229,167	-	60,645,139	17,061,458	-	-
SECTOR - 3									
SP3-1	Model Artisanal Processing Area								
Facilities		25	575,208,333	-	575,208,333	-	-	23,008,333	5,752,083
Equipment		10	68,750,000	-	68,750,000	-	-	6,875,000	2,062,500
	Total Cost of Sub-Sector		643,958,333	-	643,958,333	-	-	29,883,333	7,814,583
SP3-2	Export Promotion Services								
Facilities		25	73,333,333	-	73,333,333	-	-	2,933,333	733,333
Equipment		10	20,625,000	-	20,625,000	-	-	2,062,500	618,750
	Total Cost of Sub-Sector		93,958,333	-	93,958,333	-	-	4,995,833	1,352,083
SP3-3	Quality Control Laboratory & Equipment								
Facilities		25	43,541,667	43,541,667	-	1,741,667	435,417	-	-
SP3-4	Sanitation facilities / equipment related to processing								
Facilities		25	114,583,333	-	114,583,333	-	-	4,583,333	5,729,167
Equipment		15	1,833,333	-	1,833,333	-	-	122,222	91,667
	Total Cost of Sub-Sector		116,416,667	-	116,416,667	-	-	4,705,556	5,820,833
TOTAL OF SECTOR - 3									
	Facilities		806,666,667	43,541,667	763,125,000	1,741,667	435,417	30,525,000	12,214,583
	Equipment		91,208,333	-	91,208,333	-	-	9,059,722	2,772,917
	Total		897,875,000	43,541,667	854,333,333	1,741,667	435,417	39,584,722	14,987,500

Table III.2.8-3 Project Cost and Physical Life by Components of Kayar Project

Unit: FCFA

	Facilities & Equipment	Life	Kayar Zone 2 Total cost	1999 Phase 1 a	2000 Phase 1 b	1999 (Phase 1a)		2000 (Phase 1b)	
				Investment Cost		Depreciation	Maintenance	Depreciation	Maintenance
SECTOR - 4, 5, & 6									
SP4-1	Facilities / equipment for Retail Market								
Facilities		25	91,666,667	-	91,666,667	-	-	3,666,667	916,667
Equipment		15	4,583,333	-	4,583,333	-	-	305,556	137,500
	Total Cost of Sub-Sector		96,250,000	-	96,250,000	-	-	3,972,222	1,054,167
SP4-2	Basic infrastructure/services								
	For Community								
Facilities		25	155,833,333	-	155,833,333	-	-	6,233,333	1,558,333
Equipment		15	10,083,333	-	10,083,333	-	-	672,222	504,167
	Total Cost of Sub-Sector		165,916,667	-	165,916,667	-	-	6,905,556	2,062,500
	For Complex								
Facilities		25	693,000,000	693,000,000	-	27,720,000	6,930,000	-	-
Equipment		15	6,187,500	6,187,500	-	412,500	309,375	-	-
	Total Cost of Sub-Sector		699,187,500	699,187,500	-	28,132,500	7,239,375	-	-
	TOTAL OF SECTOR 4		961,354,167	699,187,500	262,166,667	28,132,500	7,239,375	10,877,778	3,116,667
SP5	General Education & Training Facilities & Equipment								
	OJT Training Center								
Facilities		25	55,000,000	-	55,000,000	-	-	2,200,000	550,000
	• OJT Trafning Equipment								
Equipment		15	11,458,333	-	11,458,333	-	-	763,889	572,917
	Dormitory								
Facilities		25	77,916,667	-	77,916,667	-	-	3,116,667	779,167
Equipment		15	916,667	-	916,667	-	-	61,111	45,833
	TOTAL OF SECTOR 5		145,291,667	-	145,291,667	-	-	6,141,667	1,947,917
SP6	Administration & monitoring equipment								
	• Administration / Monitoring Facilities								
Facilities		25	252,083,333	252,083,333	-	10,083,333	2,520,833	-	-
	• Administrative Equipment								
Equipment		5	28,691,667	28,691,667	-	5,738,333	860,750	-	-
	• Canteen								
Facilities		25	38,958,333	-	38,958,333	-	-	1,558,333	389,583
	• Canteen Equipment								
Equipment		10	9,166,667	-	9,166,667	-	-	916,667	275,000
	TOTAL OF SECTOR 6		328,900,000	280,775,000	48,125,000	15,821,667	3,381,583	2,475,000	664,583
SP7	Miscell Support Facilities & Equi								
Facilities		25	563,750,000	563,750,000	-	22,550,000	5,637,500	-	-
Equipment		5	14,208,333	14,208,333		2,841,667	426,250	-	-
	TOTAL OF SECTOR 7		577,958,333	577,958,333	-	25,391,667	6,063,750	-	-
TOTAL OF SECTOR - 4,5,6									
	Facilities		1,928,268,333	1,508,833,333	419,375,000	60,353,333	15,088,333	16,775,000	4,193,750
	Equipment		85,295,833	49,087,500	36,208,333	8,992,500	1,596,375	2,719,444	1,535,417
	Total		2,013,564,167	1,557,920,833	455,583,333	69,345,833	16,684,708	19,494,444	5,729,167
TOTAL OF PROJECT COST									
	FACILITIES		4,943,583,333	3,376,541,667	1,567,041,667	135,661,667	33,765,417	62,681,667	20,253,750
	EQUIPMENT		685,712,500	107,066,667	578,645,833	12,987,639	4,495,333	58,506,250	18,395,208
	TOTAL COST IN FCFA		5,629,295,833	3,483,608,333	2,145,687,500	148,049,306	38,260,750	121,187,917	38,648,958
	Consultancy cost (8%)		450,343,667	278,688,667	171,655,000				
	Physical contingency (5%)		281,464,792	174,180,417	107,284,375				
	Price escalation (3%)		168,878,875	104,508,250	64,370,625				
	Re-mobilization cost (5%) for Phase 1b.		107,284,375	-	107,284,375				
	TOTAL COST IN FCFA		6,637,267,542	4,040,985,667	2,596,281,875				

Assumptions:
1 Constant price as of July 1997.
2 Foreign Exchange Rate: 120 Yen to 1US$ to FCFA 550.
3 Price escalation rate of the project cost assumed at 3% per year.
4 Physical contingency is assumed at 5% of total construction cost.
5 Consultancy fee is assumed at 8% of total construction cost.

Table III.2.8-4 Number of Personnel and Annual Personnel Cost of Kayar Project

Unit: FCFA

		Kayar Project		
		Agency	No.	Annual Salary
Director (General Manager)		DOPM	1	4,200,000
Sector-1 (Division 1) Fish Resources & Production				
1 Chief		DOPM	1	3,000,000
2 Technician	Fish resources managment	CRODT	1	1,800,000
3 Technician	Security conrol	PSPS	1	1,800,000
4 Technician	Fishing modernization	CAEP	1	1,800,000
5 Techinician	Fish landing activities	CAEP	1	1,800,000
	Sub-total		5	10,200,000
Sector-2 (Division 2) Fish Marketing				
1 Chief		DOPM	1	3,000,000
2 Technicians	Fish marketing	DOPM	3	5,400,000
3 Technicians	Ice plant& cold storage	DOPM	2	3,600,000
4 Technician	Fish marketing support	DOPM	1	1,800,000
	Sub-total		7	13,800,000
Sector-3 (Division 3) Fish Process & Quality Control				
1 Chief		DOPM	1	3,000,000
2 Technician	Export promotion	DOPM	1	1,800,000
3 Technician	Internal quality inspection	DOPM	1	1,800,000
4 Technician	Quality control laboratory	DOPM	1	1,800,000
5 Technician	Model artisanal processing support	CAEP	1	1,800,000
	Sub-total		5	10,200,000
Sectors 4,5,&6 (Division 4) Admin. & Finances				
1 Chief		DOPM	1	3,000,000
2 Employed	Accountant	Contract	2	3,120,000
3 Employed	Clerk	Contract	3	3,600,000
4 Employed	Living environment	Contract	2	1,920,000
5 Technician	Education & training	DOPM	1	1,800,000
6 Employed	Credit support	Contract	1	1,560,000
7 Technician	FMIS	DOPM	1	1,800,000
8 Employed	Sanitary & environ. control	Contract	1	960,000
	Sub-total		12	17,760,000
	Total		30	56,160,000

Table III.2.8-5 Revenue Accured of Kayar Project

Unit: FCFA

	Unit Fee	Kayar Quanity 1995	Kayar Quanity 2010	Kayar 1995	Kayar 2010
SECTOR 1					
SP1-2 Fishing modernization				63,650,000	63,650,000
SP1-3 Fishing gear storage					
Type - 1	100/unit/day	20	20	730,000	730,000
Type - 2	80/unit/day	60	60	1,752,000	1,752,000
SP1-4 Workshop & equipment				9,350,000	9,350,000
SP1-5 Boat building yard				3,553,000	3,553,000
Sub-total				79,035,000	79,035,000
SECTOR 2					
SP2-1 Market hall, truck berth				22,485,000	29,200,000
1) Wholesalers					
- Registration (annual)	5000/year	60	83	300,000	415,000
- Daily users	500/day/person	57	80	8,550,000	12,000,000
2) Wholesaler room		15	15	4,785,000	4,785,000
3) Fish box	50/box/day	350	350	5,250,000	5,250,000
4) Truck berth					
Trucks	1500/day/truck	8	15	3,600,000	6,750,000
SP2-2 Ice Plant & Cold Storage				64,500,000	120,000,000
Fresh fish storage	10/kg/day	4 tons/day	15 tons/day	12,000,000	45,000,000
Block ice sales	600/block (25kg)				
Plate ice sales	1000/tray (40kg)	7 tons	10 tons	52,500,000	75,000,000
SP2-3 Fish Collection Depot					
Sub-total				86,985,000	149,200,000
SECTOR 3					
SP3-1 Model Artisanal Process				3,767,500	3,767,500
Storage for processed fish				2,200,000	2,200,000
SP6					
Canteen				3,135,000	3,135,000
Sub-total				9,102,500	9,102,500
Total				175,122,500	237,337,500

Remarks:
Only ice used for marketing is crushed; about 70% of 25 tons in Saint Louis in 1995.

Table III.2.8-6 Income Statement and Cash Flow of Kayar Project

Unit: 1000 FCFA

	0	1	2	3	4	5	6	7	8	9	10	11	12
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
I. Income Statement													
A. Revenue		175,122	179,495	184,088	188,912	193,978	199,299	204,887	210,757	216,921	223,395	230,195	237,337
1) Sector 1		79,035	79,035	79,035	79,035	79,035	79,035	79,035	79,035	79,035	79,035	79,035	79,035
2) Sector 2		86,985	91,358	95,951	100,775	105,841	111,162	116,750	122,620	128,784	135,258	142,058	149,200
3) Sector 3		5,967	5,967	5,967	5,967	5,967	5,967	5,967	5,967	5,967	5,967	5,967	5,967
4) Sector 4		3,135	3,135	3,135	3,135	3,135	3,135	3,135	3,135	3,135	3,135	3,135	3,135
B. Expenditure		285,976	376,933	376,933	376,933	376,933	376,933	376,933	376,933	376,933	376,933	376,933	376,933
1) Electricity		36,156	36,156	36,156	36,156	36,156	36,156	36,156	36,156	36,156	36,156	36,156	36,156
2) Water		9,105	9,105	9,105	9,105	9,105	9,105	9,105	9,105	9,105	9,105	9,105	9,105
3) Salary		56,160	56,160	56,160	56,160	56,160	56,160	56,160	56,160	56,160	56,160	56,160	56,160
4) Administrative		11,232	11,232	11,232	11,232	11,232	11,232	11,232	11,232	11,232	11,232	11,232	11,232
5) Maintenance		38,261	71,138	71,138	71,138	71,138	71,138	71,138	71,138	71,138	71,138	71,138	71,138
6) Depreciation		135,062	193,142	193,142	193,142	193,142	193,142	193,142	193,142	193,142	193,142	193,142	193,142
C. Income before Depreciation		24,208	(4,296)	297	5,121	10,187	15,508	21,096	26,966	33,130	39,604	46,404	53,546
D. Income after Depreciation		(110,854)	(197,438)	(192,845)	(188,021)	(182,955)	(177,634)	(172,046)	(166,176)	(160,012)	(153,538)	(146,738)	(139,596)
II. Cash Flow													
A. Source of Fund	6,529,985	24,208	(4,296)	297	5,121	10,187	15,508	21,096	26,966	33,130	39,604	46,404	53,546
1) Govt.	6,529,985	0	0	0	0	0	0	0	0	0	0	0	0
2) Depreciation		135,062	193,142	193,142	193,142	193,142	193,142	193,142	193,142	193,142	193,142	193,142	193,142
3) Net income		(110,854)	(197,438)	(192,845)	(188,021)	(182,955)	(177,634)	(172,046)	(166,176)	(160,012)	(153,538)	(146,738)	(139,596)
B. Uses of Fund	6,529,985	-	-	-	-	-	42,900	-	-	-	-	-	42,900
1) Construction	6,529,985	0	0	0	0	0	0	0	0	0	0	0	0
2) Reinvestment		0	0	0	0	0	42,900	0	0	0	0	0	42,900
C. Net cash flow		24,208	(4,296)	297	5,121	10,187	(27,392)	21,096	26,966	33,130	39,604	46,404	10,646

Table III.1.8-7 Income Statement and Cash Flow of Saint Louis Project (Revenue Earning Components)

Unit: 1000 FCFA

	0	1	2	3	4	5	6	7	8	9	10	11	12
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
I. Income Statement													
A. Revenue		292,076	305,357	319,449	334,412	350,312	367,219	385,211	404,370	424,786	446,556	469,786	494,590
1) Sector 1		85,073	92,451	100,468	109,181	118,650	128,940	140,122	152,274	165,479	179,830	195,426	212,374
2) Sector 2		203,629	209,532	215,606	221,856	228,288	234,906	241,715	248,723	255,933	263,352	270,986	278,842
3) Sector 3		3,374	3,374	3,374	3,374	3,374	3,374	3,374	3,374	3,374	3,374	3,374	3,374
B. Expenditure		285,709	420,873	420,873	420,873	420,873	420,873	420,873	420,873	420,873	420,873	420,873	420,873
1) Electricity		59,197	59,197	59,197	59,197	59,197	59,197	59,197	59,197	59,197	59,197	59,197	59,197
2) Water		25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
3) Salary		38,400	38,400	38,400	38,400	38,400	38,400	38,400	38,400	38,400	38,400	38,400	38,400
4) Administrative		7,680	7,680	7,680	7,680	7,680	7,680	7,680	7,680	7,680	7,680	7,680	7,680
5) Maintenance		33,218	64,251	64,251	64,251	64,251	64,251	64,251	64,251	64,251	64,251	64,251	64,251
6) Depreciation		122,215	226,345	226,345	226,345	226,345	226,345	226,345	226,345	226,345	226,345	226,345	226,345
C. Income before Dep.		128,581	110,828	124,920	139,883	155,783	172,691	190,683	209,842	230,258	252,028	275,258	300,062
D. Income after Dep.		6,367	(115,516)	(101,425)	(86,461)	(70,561)	(53,654)	(35,662)	(16,503)	3,913	25,683	48,913	73,717
II. Cash Flow													
A. Source of Fund	4,706,853	128,581	110,828	124,920	139,883	155,783	172,691	190,683	209,842	230,258	252,028	275,258	300,062
1) Equity	4,706,853	0	0	0	0	0	0	0	0	0	0	0	0
2) Depreciation		122,215	226,345	226,345	226,345	226,345	226,345	226,345	226,345	226,345	226,345	226,345	226,345
3) Net income		6,367	(115,516)	(101,425)	(86,461)	(70,561)	(53,654)	(35,662)	(16,503)	3,913	25,683	48,913	73,717
B. Uses of Fund	4,706,853	-	-	-	-	-	25,208	-	-	-	-	-	25,208
1) Construction	4,706,853	0	0	0	0	0	0	0	0	0	0	0	0
2) Reinvestment		0	0	0	0	0	25,208	0	0	0	0	0	25,208
C. Net cash flow		128,581	110,828	124,920	139,883	155,783	147,483	190,683	209,842	230,258	252,028	275,258	274,854

Table III.2.8-8 Revenue and Expenditure of Ice Plant in Kayar Project

Unit: FCFA

Items	
Revenue	52,500,000
Expenditure	
Utility	
- Electricty	31,568,000
- Water	1,583,000
Salary	
- DOPM staff	3,600,000
- Workers	1,920,000
Administrative	720,000
Maintenance	2,486,000
Depreciation	9,900,000
Sub-total of expenditure	51,777,000
Profit before depreciation	10,623,000
Profit after depreciation	723,000

Remarks : Revenue is mainly from the sales of ice.

2.9 Environmental Impact Assessment

(1) Objectives of Environmental Impact Assessment (EIA)

The objectives of the EIA were:

1) Identification and prediction of potential impacts of project components on the physical and living environment (social, economic and environmental aspects).
2) Assessment of project impacts (short term, long term, direct, indirect, local, strategic, adverse, beneficial impacts).
3) Recommendation to avoid, mitigate, lessen or eliminate impacts.

(2) Environmental Impact Assessment Process

1) Appointment of local consultant for environmental survey work to collect baseline data and information with regards to the impact on the physical and socio-economic environment.
2) Execution of detailed surveys, data collection
   - Carry out trial questionnaire survey
   - Revise questionnaire forms after trial survey
   - Brief enumerators and helpers for carrying out questionnaire survey
   - Field survey , data collection
3) Analysis of survey / questionnaire data
   - Compilation, analysis of questionnaire survey
   - Reports, drawings, survey results from local consultant
   - Review and analyze local consultant's output
4) Identification / confirmation of potential impacts
   - During construction, O & M, and future and related activities phase
   - On physical, ecological, aesthetic, and social aspects
5) Assessment of impacts

   The lack of historical long term data for the project sites meant that the baseline data for the prediction of impact could only be gleaned from the spot surveys conducted by the local consultant and field survey data collected during Phase 1 and 2. Qualitative judgment by the experts were used to assess the impacts and whenever data was available, quantification of impact was conducted.
6) Preparation of EIA report

   The complete EIA report is in the Annex. Only the tabulated summary of the EIA and recommendations are in this section

Table III.2.9-1 Environmental Impact Assessment - Kayar (1/6)

Activity	Potential Impact	Classification	Evaluation	Countermeasures/ Comments
SITE PREPARATION / CONSTRUCTION STAGE				
Site clearing / tree cutting	- Stripping of existing vegetation and some trees	S, D, Lc, A	Impact not significant as there are hardly any vegetative cover on the site. Only trees that are in the way of construction will be cut down.	Replanting of trees and other landscaping work after construction completion will be carried out.
Excavation (Cut and Fill)	- Removal of some soil Importing of soil to use as fill	S, D, Lc, A	Impact not significant. According to the soil investigation, the soil type is mainly sand. Soil removed could be used for fill therefore there will not be much unwanted soil that will need to be disposed off site.	Unwanted or suitable excavated soil should be disposed off in proper place.
Demolition	- Demolition of some existing buildings	S, D, Lc, B, I	The impact will be significant & beneficial as the buildings are old and not maintained in good condition.	New buildings will be built in their place which will have higher function and efficiency.
Relocation	- Existing local retail market, DOPM, PSPS and CAEP activities will be relocated to another site during the construction	S, D, Lc, A, R	Impact will be significant but temporary only for the duration of the construction.	Temporary offices for DOPM, PSPS and CAEP function must be found before construction starts.
Facilities construction	- Construction activities on site will create noise, dust, and increase construction traffic on road	S, D, Lc, A, R	Impact will be significant but temporary only for the duration of the construction.	Construction activities should be restricted to working hours and constructional plant traffic should be cautioned to travel at low speed especially passing through populated areas.

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Table III.2.9-1 Environmental Impact Assessment - Kayar (2/6)

Activity	Potential Impacts	Classification	Evaluation	Countermeasures/ Comments
Temporary services (water, electricity)	- Construction activities will make use of water & electricity supply on the site	S, D, Lc, A	Impact will not be significant and temporary only for the duration of the construction. There is sufficient well water & electricity supply to the site and constructional needs will not strain the supply condition.	
Construction labour force	- labour force from outside Kayar will create demand for housing, services (transport, restaurant, etc.)	S, D, Lc, B & A	Impact will not be significant as most of the labourers may be available from Kayar. The impact will be temporary only for the duration of the construction. The beneficial benefits will be from the injection of cash into the local community from increase in economic activities of the labourers (such as house rental, meals at local restaurants, use of transport). Adverse impact is not expected to be significant as the number of outside workers will be small.	Encourage the contractor to hire local labourers from the community.
Landscaping	- landscaping of the site will seek to improve the scenery and reduce the vision impact of the structures.	L, D, Lc, B, R	Impact will be significant as the existing site is devoid of vegetation except for some scattered trees along the coast.	Encourage the planting of hardy trees and plants to cope with the harsh environment (dry climate, sandy soil, salt air).
OPERATION / MAINTENANCE STAGE				
Sector 1 - Production / Resource				
Fish resource management & monitoring	- management of the resource will ensure the long term sustainability of the fisheries industry.	L, D, St, B, R	Impact will be significant in the long term as future sustainability will be in doubt if resource management & monitoring is not implemented.	Long term monitoring and accurate data collection is essential for resource management.

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Table III.2.9-1 Environmental Impact Assessment - Kayar (3/6)

Activity	Potential Impacts	Classification	Evaluation	Countermeasures/ Comments
Improve security / safety at sea, launching and landing.	- will reduce the loss of lives and fishing boats/gears.	S, D, Lc, B, I	Impact will be significant and effect immediate. The benefit will be substantial due to lives and fishing boat/gear saved.	
Transfer landing activities of boats to new project site	- concentrated landing causing congestion and waste concentration.	L, D, Lc, A	- Impact not significant as existing landings are already concentrated in this area.	- Sanitary control at the new project site to be implemented.
Fish cleaning, sorting, packing activities	- Pollution of ground water and environment from fish waste and discharge from activities	L, D, Lc, A, R	Impact will be significant if the waste discharge is not properly handled and treated.	Project design will incorportate waste separation and proper discharge of waste water.
Preparation activities on land for fishing	- Contamination of the environment from fuel supply activities	L, D, Lc, A, R	Impact will be significant if the fuel supply yard is not designed to handle fuel spillage.	Project design will incorportate fuel trap and separaters to minimise spillage discharge.
Repair / maintenance activities	- Waste from net, boat, gear repairs. - Contamination of environment from waste oil / fuel discharge from repair activities.	L, D, Lc, A, R	Impact will be significant if the waste disposal is not managed and appropriate facilities to handle the waste discharge.	Waste disposal management, control, and facilities will be implemented in the project.
Boat building activities	- Waste from boat building activities could contaminate the boat building yard.	L, D, Lc, A, R	Impact will be significant if the waste disposal is not managed to handle the waste material.	Waste disposal management & control will be implemented in the project.
Fishing modernization activities	- Modern fishing gear and techniques will impact on the fishermen's income and way of fishing.	L, D, S, B, R	Impact will be significant and will be strategic as the modern fishing technique and gear will be promoted not only in Kayar area but also throughout the nation.	Equity of access to participate in these activities must be assured by user groups.

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Table III.2.9-1 Environmental Impact Assessment - Kayar (4/6)

Activity	Potential Impacts	Classification	Evaluation	Countermeasures/ Comments
Fishing modernization activities	- Impact on fishing activities could be on more efficient and cost effective fishing which in turn will impact on fisheries resources.	L, D, S, B, R	Impact on fisheries resources will be significant if fishing activities are not done in line with resource management & monitoring activities.	Resource management & monitoring must be implemented in line with fishing modernization.
Privatised activities - repair workshops - fuel supply - rubbish collection - cleaning services	- The privatised activities will encourage competition, greater opportunities and spin-off activities.	L, D, Lc, B	Impact will not be significant as there are existing privatised activities at the site.	Project will encourage these privatised activities to promote sustainable and equitable services.
Sector 2 - Marketing / Distribution				
Fish market activities - fish sorting - cleaning / washing	- These activities will increase waste water generated.	L, D, Lc, A, R	Impact will be signifant as these activities will be concentrated within the complex.	Project will provide adequate water supply and waste handling/ disposal facilities.
- buying / selling - distribution / traffic	- These activities will mean an increased people and vehicle movement, impacting on noise and exhaust emission.	L, D, Lc, A, R	Impact will be significant within the complex due to the concentration of people and traffic to conduct these activities. Impact of exhaust emission is not expected to be significant due to the open nature of the complex design and no inhabitants living within the complex.	Project design will cater to the volume of people and traffic. Adequate truck berth & parking will be provided to handle the vehicle traffic.
Ice plant / cold storage - Water consumption	- These operation impact on the water supply and generate waste water.	L, D, Lc, A, R	Impact on water source will be significant as the existing ground water supply in Kayar is already showing salt intrusion.	Ground water from a source 3.5 km away will be proposed as water supply source for project. Waste water generated will be adequately handled by the project's waste handling/ disposal facilities.

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Table III.2.9-1 Environmental Impact Assessment - Kayar (5/6)

Activity	Potential Impacts	Classification	Evaluation	Countermeasures/ Comments
Ice plant / cold storage - Ice supply and storage	- These will impact on increased fish quality and maintaining freshness.	L, D, St, B, R	Impact will be significant as existing ice supply cannot meet local demand and storage facilities are not adequate.	Equity of access to be ensured by user group and autonomous body.
Fuel supply activities	- Impact from accidental fuel spillage leading to contamination of soil and ground water.	S, D, Lc, A, R	Impact will be significant as existing site does not have fuel supply activities and is not contaminated.	Project will provide adequate fuel handling/ disposal facilities to cope with any accidental spillage.
	- Possible fire hazard.		Impact will be significant as damage from fire will be drastic and may affect the whole operation of the complex.	Fuel depot will be located away from complex to minimise fire hazard. Project will incorporate fire safety & fighting equipment.
Sector 3 - Artisanal Processing				
Improve sanitation and working environment of existing processing areas	- Improved sanitation of working environment, impacting on health of processors, reduction of health risk / epidemic, and improving quality / hygiene of products.	L, D, Lc, St, B, R	Impact will be significant and health impact will not only be local (i.e.the local processors) but also strategic (i.e. the consumers of the exported products).	Equity of access to be assured by the user group and autonomous body.
Quality improvement / inspection / control activities	- Product quality and sanitation will be controlled and improved impacting on the health of the consumers.	L, D, St, B, R	Impact will be significant and health impact on consumers will not only be local but strategic as the products are exported to neighbouring countries.	Equity of access to be assured by the autonomous body.
Sector 4 - Community Development				
Improve literacy & health/sanitary awareness	- Knowledge empowerment will impact on behavioural changes that may lead to improved quality of life.	L, I, St, B, R	Impact will be indirect and significant for the improvement of the life of the community.	Equity of access to be assured by the user group.

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Table III.2.9-1 Environmental Impact Assessment - Kayar (6/6)

Activity	Potential Impacts	Classification	Evaluation	Countermeasures/ Comments
Community infrastructure / facilities improvement	- These will provide the community with better services to improve their quality of life.	L, I, St, B, R	Impact will be indirect and significant for the improvement of the life of the community.	Equity of access to be assured by the user group.
Sector 5 - Education / Training				
Training of fishermen & processors - fishing techniques, safety, resource management - out of school education - processing techniques - quality & sanitation	- Knowledge empowerment will impact on behavioural changes that may lead to improved quality of life.	L, I, St, B, R	Impact will be indirect and significant for the improvement of the life of the beneficiaries and community	Equity of access to be assured by the user group.
Training of DOPM, CRODT, CAEP, PSPS - -	- Training will improve the knowledge and facilitate sustainable fisheries activities and of the complex operation.	L, D, St, B, R	Impact will be significant as training of the upper level beneficiaries will be necessary for the continued operation of the complex.	Equity of access to be assured by the autonomous body.

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