

Japan International Cooperation Agency (JICA)

Ministry of Fishery and Marine Transportation (MPTM)

Republic of Senegal

**THE STUDY ON THE DEVELOPMENT PROGRAM  
FOR  
NORTHERN FISHING AREAS  
IN  
THE REPUBLIC OF SENEGAL**

**Final Report  
Annex**

November 1997

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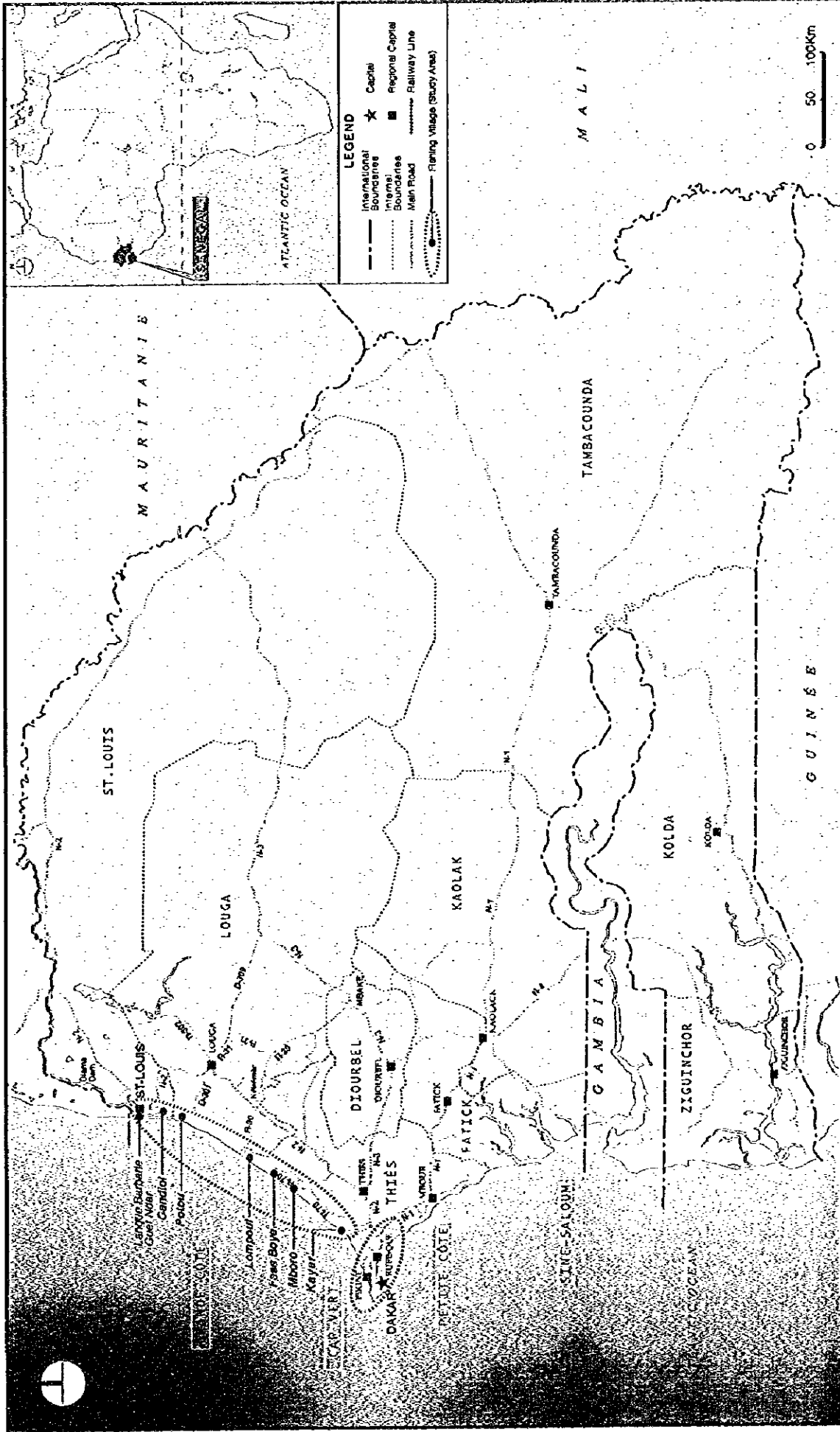
**Annex**

**November 1997**

**SYSTEM SCIENCE CONSULTANTS INC.**



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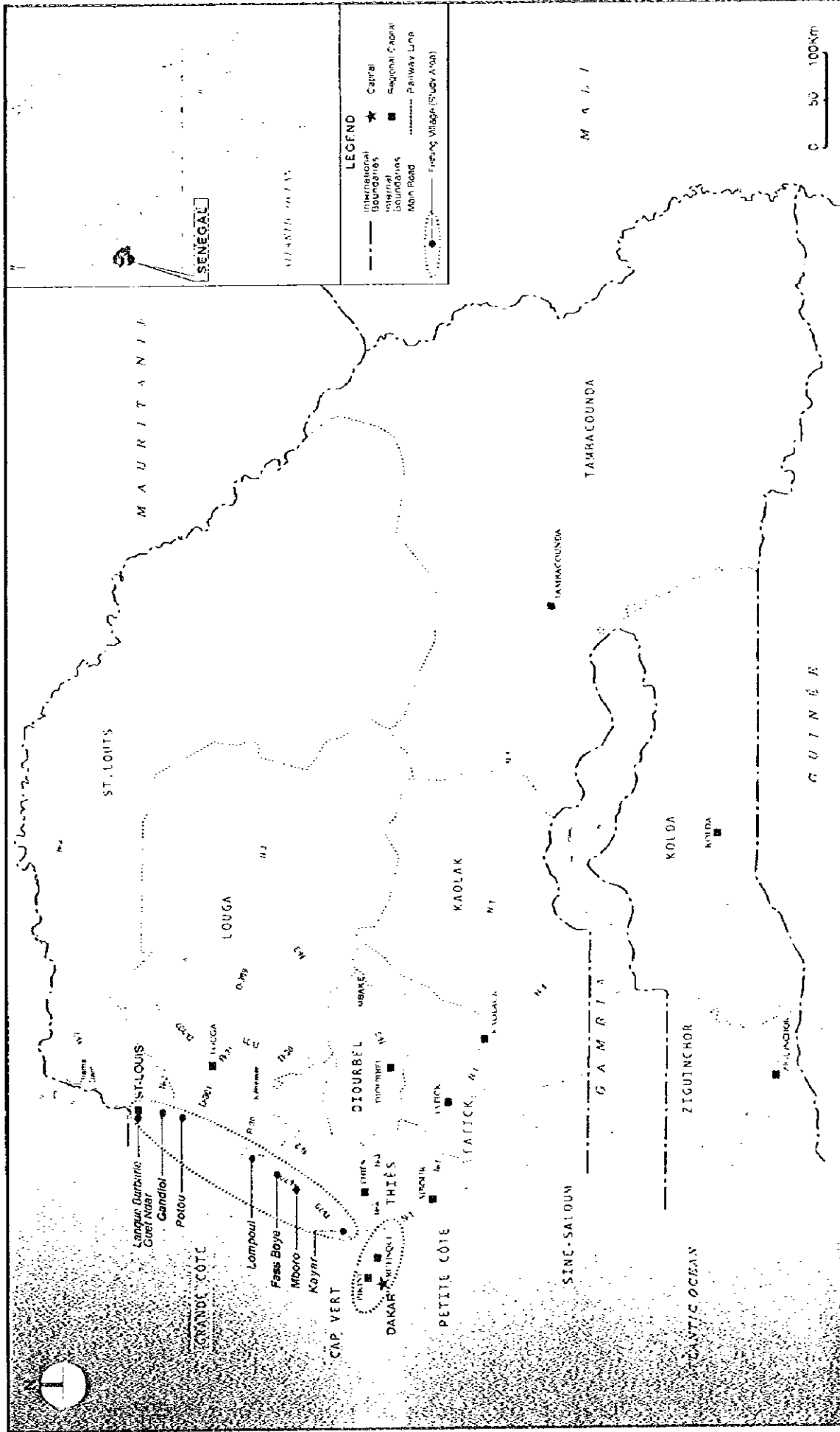
THE STUDY ON THE DEVELOPMENT PROGRAM  
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JAPAN INTERNATIONAL COOPERATION AGENCY

Survey Map : General



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THE STUDY ON THE DEVELOPMENT PROGRAM  
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 JAPAN INTERNATIONAL COOPERATION AGENCY

Survey Map : General

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## Acronyms

ACDI	Agence Canadienne de Developpement International
ACEP	Alliance for Credit and Savings for Production
ADPES	Associations pour un Dynamique de Progres Economique et Social
AFNOR	Association Française Norm
AGETIP	Agence d'Execution des Travaux d'Interet Public
APIMEC	Association Professionnelle des Institutions Mutualistes ou Coopératives d'Epargne et de Crédit au Sénégal
ATEPAS	Assistance for Technology in Artisanal Fisheries in Senegal
BAD	Banque Africaine de Developpement
BCEAO	Banque Centrale des Etats de l'Afrique de l'Ouest
BCPH	Bureau de Contrôle des Produits Halieutiques
BHN	Basic Human Needs
BHS	Banque de l'Habitat du Sénégal
BIAOS	Banque International de l'Afrique de l'Ouest - Sénégal
BICIS	Banque International pour le Commerce et l'Industrie du Sénégal
BOAD	Banque Ouest Africain de Développement
BST	Banque Sénégalalo-Tunesienne
CAEP	Centre d'Assitance et d'Experimentation de la Peche et de Vulgarization
CAMP	Centre d'Assistance a la Motorisation des Pirogues
CAPAS	Centre d'Aide a la Peche Anisanale au Senegal
CBAO	Compagne Bancaire de l'Afrique Occidentale
CCCE	Caisse Centrale de Cooperation Economique
CFA	Communaute Financiere Africaine
CFD	Caisse Francaise de Développement
CFM	Dakar Central Fish Market
CICM	Centre International de Credit Mutuel
CIREP	Interministerielle de Retrocession des Equipements de Peche
CLS	Credit Lyonnais du Sénégal
CMS	Credit Mutuel du Sénégal
CNC	National Coordination Committee (of savings & loan mutuelles)
CNCAS	Caisse National de Credit Agricole de Senegal
CNPS	Collective National des Pecheurs du Sénégal
CNTS	Confederation Nationale des Travailleurs du Sénégal
COPACE	Comite des peches pour l'Atlantique Centre-Est
COPAR	Conseil et Parterairiat Entreprise
CPM	Centre de Pêche Mishirah
CREDETIP	Centre de Recherches pour le Développement des Technologies Intermédiaires de Pêche
CRODT	Centre de Recherches Océanographiques, Dakar-Thiaroye
CSE	Centre Suivi Ecologique
CSRP	Commission Sub-Regional de la Pêche
CTL	Conservation des Terres du Litoral
DAT	Fixed term deposit (depôt à terme = Fr.)
DID	Developpement International Desjardins
DOPM	Direction de l'Océanographic et des Pêches Maritimes
DPS	Direction de la Prévision et de la Statistique
EEl	Examen de l'Environnement Initial
EIA	Environmental Impact Assessment
EPI	Expanded Programme of Immunization
ESAF	Extended Structural Adjustment Facility
EU	European Union
FAD	Fonds Africaine de Developpement
FAO	Food and Agriculture Organization

FCFA	Franc CFA
FED	Fonds European de Développement
FENAGIE	National Federation of GIEs
FNP	National of Federation of Fishermen
GAIPES	Groupment des Amateurs et Industriels de la Pêche au Sénégal
GDP	Gross Domestic Product
GIE	Groupement d'Intérêt Economique
GIMES	Groupement Interprofessionnel des Marceurs Exponateurs
GRT	Gross Registered Tonnage
HACCP	Hazard Analysis and Control of Critical Points
HP	Horsepower
ICSF	International Collective in Support of Fishworkers
IDAF	Integrated Development of Artisanal Fisheries (= DIPA Fr.)
IEE	Initial Environmental Examination
IFAD	International Fund for Agricultural Development (= FIDA Fr.)
IFC	International Finance Corporation
IFREMER	Institut Français de Recherche pour l'Exploitation de la Mer
ILO	International Labour Organization (= BIT Fr.)
IMF	International Monetary Fund (= FMI Fr.)
INFO-PECHE	l'Organisation Intergouvernementale d'Information sur la Commercialisation du Poisson en Afrique
ISRA	Institut de Technologie Alimentaire
IT/R	Interim Report
ITA	Institut de Technologie Alimentaire
JICA	Agence de Cooperation Internationale Japonaise
KVA	Kilovolt Ampere
LC	Letter of Credit
MASY	Maximum Annual Sustainable Yield
MCH	Maternal and Child Health
MCP	Marché Central aux Poissons de Dakar
MEFP	Ministère de l'Economie, des Finances et du Plan
MEPN	Ministère de l'Environnement et de la Protection de la Nature
MFDC	Mouvement des Forces Démocratiques de Casamance
MPTM	Ministère des Pêches et des Transports Maritimes
MSY	Maximum Sustainable Yield
MT	Metric tons
NGO	Non-Governmental Organization
NPA	New Agricultural Policy
NPI	New Industrial Policy
OAU	Organization of African Unity
OECD	Organization of Economic Cooperation and Development (= OCDE Fr.)
OJT	On the Job Training
O & M	Operation and Management
OMVS	Organisation de Mise en Valeur du Fleuve Sénégal
ONCAD	National Office for Cooperation and Development Assistance
ORANA	Organisme de Recherche sur l'Alimentation et la Nutrition en Afrique
ORSTOM	Office de Recherche Scientifique et Technique d'Outremer
PAFGC	Programme d'Autopromotion des Femmes de la Grande Côte
PAGPF	Project d'Appui aux Groupements de Promotion Feminine
PAMECAS	Project of Assistance to Savings and Loan Mutuelles
PAMEZ	Projet pour la Peche Artisanale Maritime dans la region de Ziguinchor
PAPEC	Petite Côte Artisanal Fisheries Project

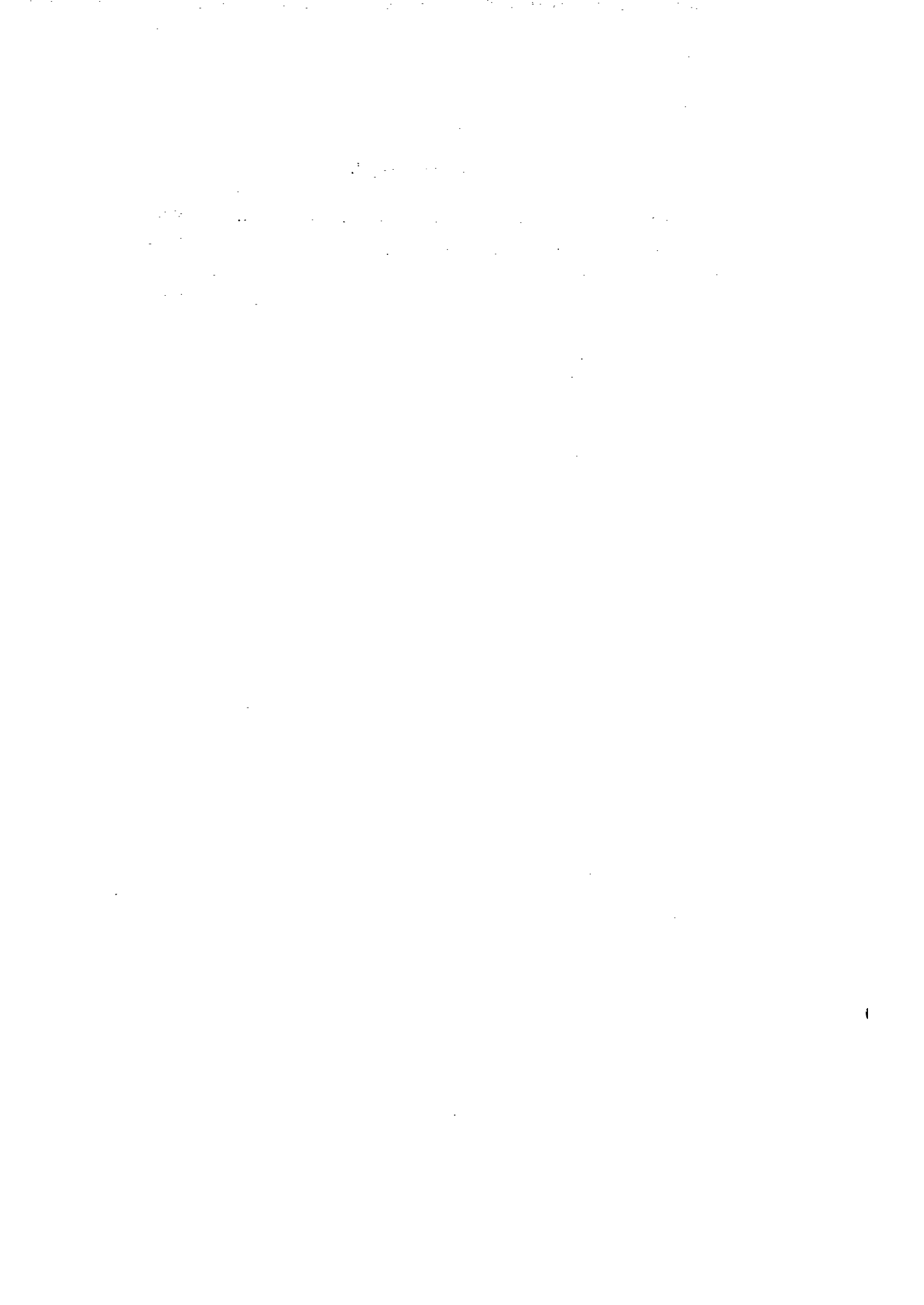
PASMEC	Programme d'Appui aux Structure Mutueliste d'Epargne et Cr�dit (CIDA-funded)
PAT	Project d'Appui Technique et Technologique
PHC	Primary Health Care
PME/PMI	Petites et Moyennes Entreprises/Petites et Moyennes
PNUD	Programme des Nations Unies pour le Developpement
PPE	Pauvret�/Population/Environnement
PROPAC	Casamance Artisanal Fisheries Project
PROPECHE	Canadian Fisheries Project (Grande C�te north of Dakar)
PPS	Protection et Surveillance des Peches au S�n�gal
SARL	Limited Liability Company
SDR	Special Drawng Rights
Servi-Peche	Credit am of Canadian-funded Pro-Peche project on Grande C�te
SGBS	Soci�t� Generale des Banques au S�n�gal
SIDA	Swedish International Development Agency
SOFSEDT	Soci�t� Financiere S�n�galaise pour le D�veloppement de l'Industrie et du Tourisme
SONAGA	Soci�tee Nationale de Garantie, d'Assistance et de Cr�dit
SP	Sub-Project
SRPM	Services R�gional de P�ches
UEMOA	Union Economique et Mon�taire Ouest-Africaine
UNDP	United Nations Development Programme (= PNUD Fr.)
UNICEF	United Nations Children's Fund
UOPAGC	Union des Operatrices de la Peche Artisanale de la Grande Cate
UPAMES	l'Union Patronale des Mareyeurs-Exponateurs
USAID	United States Aid
USD	United States Dollar
VAT	Value-Added Tax (Fr. = TVA)
WB	World Bank
WFP	World Food Programme
WHO	World Health Organization
WID	Women in Development
WTO	World Trade Organization (= OMC Fr.)
ZEE	Zone Economique Exclusive

**Appendix 1**

**WORKSHOPS CONDUCTED  
IN  
SAINT LOUIS, KAYAR AND DAKAR**

## WORKSHOPS

1. Introduction..... WS - 1
2. Saint Louis (Zone-1) Workshop..... WS - 3
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## 1 Introduction

The government of Senegal formally requested a study to improve in the existing fishery sector in the northern fishing areas in Senegal. In response to this request, Japan International Cooperation Agency (JICA) implemented the "Study on the Development Program for Northern Fishing Areas in the Republic of Senegal" (hereinafter, refer to as "the Study") from September 24, 1996 to November 28, 1997, according to the preliminary survey carried out in January 1996 and the S/W (Scope of Work) mission in March 1996.

The objectives of the Study were to grasp the conditions pertaining to artisanal fisheries in the target area and to formulate a master plan which focuses on improving the fishing communities, in order to enable beneficiaries such as the fishermen to achieve sustainable fishing, processing and marketing, and an improved standard of living. A feasibility study was carried out on selected priority projects, in order to draw up an equipment procurement plan and a facility design plan.

The Study was carried out for thirteen months in two phases from September 1996 through November 1997. The Phase I Study was implemented from September 1996 through March 1997 with the aim of developing the Master Plan, including the priority projects. The Phase II Study was conducted from May through November 1997 to implement a feasibility study on the priority alternative programs and plans selected in the Phase I Study.

The area targeted by the study was the northern coastal area (the Grande Côte) extending from Dakar to Saint Louis. Six fishing villages in the northern coast, including Saint Louis and Kayar, and ten fishing villages were selected in the Dakar region.

The Phase I Study was implemented for the purpose of formulating the Master Plan and the selecting the priority projects. The study team collected information on the existing conditions, with the participation of counterparts and representatives from the study area, through interview surveys and discussions. The Phase II study implemented a feasibility study on the priority projects. The participatory method was utilized through workshops conducted at the regional level in Saint Louis and Kayar and at the national level in Dakar with the assistance of counterparts. The master plan and action plan were revised based on the comments made in the workshops. A seminar was held on September 30, 1997 to explain the contents of the master plan to the officials, beneficiaries as well as donors.

Workshops was conducted on May 27 in Saint Louis and on June 3 in Kayar during the Phase II study to receive opinions and needs of the beneficiaries

(fishermen, processors, wholesalers), community leader, village leader, and other representatives in the priority areas. In the Saint Louis and Kayar workshops, after the explanation of the plans by the study team, group meeting by beneficiaries were held independently with the active participation of the study team members, counterparts and beneficiaries, and the results of group meeting were reported by the counterpart to all participants. The comments through the workshops were summarized by both leaders of the study team and the counterparts, and it was incorporated into the Master Plan.

This report is a final report which contains a summary, a main report and annex. The main report was organized into chapters describing the existing conditions of the artisanal fisheries sector, the master plan, the feasibility study of the Saint Louis and Kayar project, the institutions and organizations, the action plan, and the conclusion and recommendations, minutes of the meeting, the list of data collected and the list of the persons contacted for the study. The annex includes summary of the workshops conducted in Saint Louis, Kayar and Dakar, environmental impact assessment survey, fishing community development survey.

Workshop conducted in Dakar on June 23 was to solicit opinions, needs and consensus on the contents of the Master Plan and Feasibility Study from regional officers, representatives of relevant agencies concerned. The team leader explained the Master Plan and institutional building to regional officers in the North Coast of Senegal, representatives of relevant agencies concerned such as CRODT, Ministry of Interior, Ministry of Finance and Planning, CAEP and PSPS.

The record of the workshops conducted in Saint Louis, Kayar and Dakar are summarized in Appendix 1.

## 2. Saint Louis (Zone-1) Workshop

Date: May 27, 1997, Tuesday 9:00 - 17:00

Place: DOPM regional office in Saint Louis

Participants: refer Appendix-1

Chairman : El Hadji CISSE

Schedule:

9:30-12:30 Presentation by JICA Study Team Leader (Tateo Kusano)  
12:30-13:30 Sector group meetings  
13:30-15:00 Lunch  
15:00-16:30 Reporting of each sector group by Senegalese counterparts  
16:30-17:00 Closing speech by Tateo Kusano and El Hadji Cisse

### 2.1 Opening

The Regional DOPM officer Mr. Mamadou Sy welcomed the 35 participants and explained the aim and objective of the workshop, and requested their full cooperation during the workshop as well as for their assistance in the field during the survey. Mr. Cisse took the floor to welcome the participants and went on to introduce the study team members and their counterparts and their role in the study. The need for the project was strongly emphasized and then summarized.

Mr. Tateo Kusano explained the objective of the projects and using figures and charts, explained the data and information the study had collected in the Phase 1 study, presented a brief summary of the existing conditions and the constraints and issues grasped by the team, and the tentative plans contained in the interim report, in order to get the opinions and views of the participants in the sector group meeting.

### 2.2 Sector group meeting

#### (1) Fisherman Group

Leaders of the Group : T. Yamamoto, Akaoka and Kane

Interpreter : Thierno DIALLO

Participants:

- |                          |                      |
|--------------------------|----------------------|
| 1) Obeye DATT FALL       | 6) Mame LATYR NDIAYE |
| 2) Amadou GUEYE          | 7) Djibril DIA       |
| 3) Elhadj MATALIBE NIANG | 8) Amadou GUEYE      |
| 4) Daouda BA             | 9) Assane NDIAYE     |
| 5) Adama DIAW            | 10) Assane NDIAYE    |

Highlights of the group meeting:

- a. The group leader explained clearly to the participants the main purpose of the team members is to see that on the basis of the proposed projects how the fishermen could get more benefit and advantages, and to reduce the demerits that may arise in future.
- b. Two options chosen that is to set up fishing production infrastructure and facilities and to set programs for education and training, and to set up adequate framework of organization and institutional strengthening.
- c. Study Team explained that the proposed fishery complex would provide advantages such as the followings:
  - the possibility to know the price of fresh fish on the spot
  - the presence of many wholesalers under one roof and at the same time would lead to competition and to maximize their profit.
  - the possibility to get necessary and efficient services in a same site such as ice supply, fuel, lighting for late night fish landings, etc.
  - the fish storage facilities that would reduce quality loss and ensure timely and better marketing possibility to store the fish safely until having a better and marketing opportunity.
- d. Fishermen should not fear about the development changes and in fact it will be profitable.
- e. Fishermen have recognized the fact that increase in the number of boats has brought insecurity during landings, and they urged the need for setting up several landing areas.
- f. They proposed the need for a break water system to ease fish landings, and the team responded that it is financially and technically not possible to undertake a study on the breakwater system under the current study or project.
- g. They agreed that the setting up of landing areas and improvement of equipment and techniques could suffice since a breakwater system can not be made available.
- h. Fishermen agreed on the setting up of ice plant and storage rooms because they will solve their crucial problems such as quality loss due to lack of ice, lack of storage facilities during bad season and peak season.

**(2) Wholesalers and Traders Group**

**Leaders of the Group :** I. Allahpichay and M.Gaye

**Interpreter :** Papa Mar Code FALL

**Participants:**

- 1) Arame GUEYE SENE Trader, president of women traders (all fish).
- 2) Adja Farma FALL Trader (fresh fish & Sardine).
- 3) Adja Khady SARR DJADJI Trader (Sardine).
- 4) Thian BA Trader all fish (own boat).
- 5) Mame Fatou GUI KAIRE Biggest wholesaler in St.Louis.
- 6) Djibril DIA Official from the Ministry of Planification, Representative of the Regional office.
- 7) El Hadji Ousseynou DIEYE Trader (fresh fish), President of the Regional Association of Wholesalers.
- 8) Moustapha BEYE Trader (Fresh fish), Vice-president of the Association.
- 9) Babacar NDIAYE Trader (fresh fish), Treasurer.
- 10) Cheikh Sidate DIEYE Trader, Secretary.
- 11) Balla SECK Ice Breaker.
- 12) Demba LEYE Carrier.

**Highlights of the Group Meeting:**

- a. The group leader explained briefly the purpose of the project and proposed facilities and services that are to be introduced in the project. It was explained to them that in proposing the alternate plans at this level is based on the constraints and problems that we have grasped in the Phase 1 study. This group meeting was necessary to confirm and justify our findings and to accept their opinions.
- b. They agreed on our findings and also on the proposed plans in order to alleviate their constraints and hardships they are currently facing.
- c. They agreed that the project would bring benefits and services; would reduce quality and quantity loss; avoid pilferage; stable supply of ice and fish handling at ease and quick as some have expressed a loss about 100 to 300 kg of fish at final destination.
- d. Some wholesalers expressed the assistance from fish exporters is limited only to supply of ice, and they are also at the mercy of these factories who offer

low prices when fish products are taken to Dakar by wholesalers. The factories are aware that the wholesalers have no choice once they have taken the fish to the factory. Some wholesalers have started using phone to find out the price before delivery the fish.

e. Three ladies (fish processor cum trader) in the expressed their opinion and problems experienced by them.

- She buys fresh fish from boats to make salted and dried. Shark and Sardine are bought fresh. Spoiled (degrading) fish is used to make Guedji fermented and dried. Sali is sold to special people who take it to Dakar. Guedji and Ketiakh are sold in St. Louis at the market.
- She buys daily about one ton or more in peak season and about 100kg in lean season. She pays CFA 1,500 CFA to 2,000 a trip by cart for transport to her working area, and some times to avoid this transportation fees, she buys near her own working area.
- Problems for processed fish trader are:
  - One landing site at the complex would not solve her problems except if the complex can provide a truck for product delivery.
  - Her working material is very heavy, it could of great help if boats (some) could land the type of product she needs in her working area.
  - In rainy season, she's got no shelter to protect her product (loss).
  - Salt is very expensive, CFA 1,200 CFA to 1,500 CFA a bag of 40kg to 50kg.
  - She needs knives, material, tables, pigtails to put the product to dry, storage, tarpaulin bags to protect the product.

(3) Processor group

Leaders of the Group: ISHIDA / NDIAYE

Interpreter : Nata SAMB

Interpreters:

Mme. Khady SARR DIEYE: wholesaler in Guet Ndar  
president of GIE of female wholesalers  
president of female Union of Great Cote

Mme. Ndeye SENE: processor in GuetNdar  
president of GIE of female processors

Mme. Bineta BA: wholesaler in Goxonbatti  
president of GIE of female wholesalers /  
processors etc.

Mme. Rokhaya NDIAYE: processor in Goxonbatti  
president of GIE of female processors

Highlights of the comments:

- 1) Comments on the operation system of the proposed plan:
  - a. The proposed plan is basically acceptable and welcomed by the processors and wholesalers. The participants confirm that the installation of such project will solve the problems of the fishery sector in Saint Louis.
  - b. The distance from Goxou Mbacc to the new fishing complex needs to be considered; because of that, people living in Goxou Mbacc can not be the direct beneficiaries of the proposed complex. Most of the fishermen families living in Goxonbatti at present have moved from Guet Ndar due to the road construction along the Saint Louis River. They propose to have at the same time to improve some infrastructure including landing, processing, and training facilities. It is a good idea to separate the marketing and processing area from the landing area.
  - c. Processors in Guet Ndar and Hydrobase are willing to use the proposed complex if the transportation service is properly provided. It is proposed that a second processing area near the complex need to be constructed in order to cope with the congestion of the existing congested processing area in Guet Ndar.
  - d. In Guet Ndar, space and sanitation are the biggest problems for artisanal processors. Sanitation problems in the existing areas need to be solved. When the proposed plan provides a model processing area, that will be very helpful for the processors. Among the sanitation improvement, construction of public

toilet, bathroom, security in the processing area, lighting facilities etc. will contribute a lot. There is no garbage disposal system in the processing area. In addition to the plan, a day care center will be required in the complex.

2) **Comments on the BHN infrastructure improvement:**

- a. In Goxou Mbacc, there are no nearby baby delivery facilities.
- b. As for the training and education facilities, it is desirable that they are located near their work area: The branch training classes in Goxou Mbacc and Guet Ndar will be necessary beside the training center in the proposed fishing complex.
- c. Road construction plan including the access road and feeder road is very acceptable because bad road conditions have been the problems for the community members in Guet Ndar.

3) **Comments on the Management Committee:**

They all prefer to have a management committee composed of professionals (fishermen, wholesalers, processors) that will be supported by technicians from DOPM and a representative of the Municipality.



### 3. Kayar (Zone-2) Workshop

Date: June 3, 1997, Tuesday 9:30 - 17:00

Place: Community Center of Kayar

Participants: refer Appendix-1

Chairman: El Hadji CISSE

Schedule:

9:30-12:30	Presentation by JICA Study Team Leader (Tateo Kusano)
12:30-13:30	Sector group meetings
13:30-15:00	Lunch
15:00-16:30	Reporting of each sector group by Senegalese counterparts
16:30-17:00	Closing speech by Tateo Kusano and El Hadji Cisse

#### 3.1 Opening

The Regional DOPM officer Mr. Ibrahima SECK welcomed the 50 participants including the president of rural council, head of the village, and explained the aim and objective of the workshop, and requested their full cooperation during the workshop as well as for their assistance in the field during the survey. Mr. Cisse took the floor to welcome the participants and went on to introduce the study team members and their counterparts and their role in the study. The need for the project was strongly emphasized and then summarized.

Head of the village welcomed the study team and its counterparts, and went on to say the how much the villagers are gratitude to the work carried out by the Japanese. Further he requested the residents to cooperate and assist in their survey. The leader of the rural council also mentioned thanks to the team members and offered to work closely with the study team.

Mr. Tateo Kusano explained the objective of the projects and using figures and charts, explained the data and information the study had collected in the Phase 1 study, presented a brief summary of the existing conditions and the constraints and issues grasped by the team, and the tentative plans contained in the interim report, in order to get the opinions and views of the participants in the sector group meeting.

### 3.2 Sector group meeting

#### (1) Fisherman group

Leaders of the group : Yamamoto / Akaoka / John Gardner/Aboubakry Kane  
Interpreter : Thierno Diallo  
Participants:

Mbor MBAYE	Pape GUEYE
Mbussine NIANG	Birane DIOUF
Pathe DIENG	Alioune SARI
Anne NDOYE MANGARA	Aladji DIOUF
Magueye NIANG	Mbaye WADE
Joussou NDIAYE	Pathe MBAYE
Ali NDIAYE	Gaye FALL
Daouda SARI	Youssou FALL
Abdou GUEYE THIOUNE	Nouau NDIAYE
Moussa NDOYE	Galla NDOYE
Ablaye DIOP	Dao GAYE
Madieme MBENGUE	Doudou FALL DIOP

#### Highlight of the comments:

- a. The group leader explained about the advantages the fishermen can expect from this project in the area of Kayar, among others he also listed: increase in fish production; reduction in operation cost; a better fish quality and improvement in the work conditions in general.
- b. The group leader also emphasized that the objectives of Kayar sector plan can not be reached without technical improvement, particularly on the advantages of using GPS and Echo sounder for line fishing and gill net fishing, and this would enable; to find a better fishing ground, to use less fuel by taking a direct and shorter route to fishing ground and thereby reduction in fishing time and less quality loss; to choose target fish species by knowing the nature of the fishing grounds.
- c. The fishermen responded well to our presentation and agreed to proposed plans. However, some fishermen have commented on the followings.
  - Some fishermen indicated that only know the CNCAS credit ; NGO credit system is only available to women. They also mentioned that CNCAS credit do not take into account the specificity of their activities as compared

to farming and cattle raising, and that is the reason for some drawbacks such as high interest rate; short repayment period; obligatory bank charges; not taking into account the seasonality of fishing activities; high application fee; high deposit requirement; obligatory payment of insurance which they do not need;

- They also stressed that the penalty system is unfair for defaulting loans. They prefer a credit system without any deposit or guarantee and not having the above mentioned drawbacks.

- d. It is not possible to develop fishing if fishermen are not supplied easily and properly with engines (some times the companies run out of engines); the mechanics have not received proper training and proper tools and lack skills.
- e. Fishermen sometimes wait a long time in between their landing and the sale of their catches; and there is the problem of quality loss which decrease the selling price. They need proper storage facilities for the marketing of the catches; some even mentioned the storage of fish for long period (say 5 to 6 months) in order to store fish during glut season and not to sell at low price.

## (2) Wholesalers and Traders Group

Leaders of the Group : I. Allahpichay and M.Gaye

Interpreter : Papa Mar Code FALL

Participants:

- 1) El Hadj Gass NDOYE President of Wholesalers (sardine).
- 2) Cheikh Omar DIOP Vice-President (sardine wholesaler)
- 3) Papa DIOP Sardine wholesaler
- 4) Abdoulaye DIOUF Sardine wholesaler
- 5) Ndiass KA Fresh fish, high value fish & sardine wholesaler
- 6) Mamadou DIENG Fresh fish, high value fish & sardine wholesaler
- 7) Modou Fall DIOP Fresh fish, high value fish & sardine wholesaler
- 8) Mody MBAYE Fresh fish, high value fish & sardine wholesaler
- 9) Fatou Gueye NIANG Sardine wholesaler
- 10) Marsse NDOYE Sardine wholesaler

### Highlight of the comments:

- a. There are around 100 wholesalers in Kayar; 60 dealing in sardine, among whom 40 are from Kayar, 30 with high priced fish, among whom 25 are from Kayar 5 live less than 10 Km around Kayar; and 10 are intermediaries among whom 5 are from Kayar and 5 from outside Kayar (Diourbel, etc.).
- b. As for the complex they all do appreciate it, but would like to raise problems that they face related to the lack of trucks, maintenance of trucks, so as to have a better distribution system.
- c. Relationships between wholesalers and the fishermen. The fishermen are financed in part by the wholesalers to maintain stable of fish.
- d. With regard to disposal of the landings, the catches are piled up on the sand and they bargain till a agreed price. Then the wholesalers transfer the fish to truck using carriers and packed in plastic boxes or polystyrene boxes (for export). This system leads to quality loss.
- e. Regarding payment, the wholesalers pay cash or take it in credit to be paid within 24 hours. In cases when the wholesalers purchase, they do not know the exact price to pay the fishermen till the fish is taken to CFM (in case of sardines) or high priced fish to fish exporters. In Kayar there is a high competition for high price fish by collectors who sometimes pay high price in

order to be able to supply the order from Dakar.

- f. Factories usually send order for certain species and quantity and time. It is up to the collectors and/or wholesalers to manage the procuring of the supply; especially there is a tough competition for thiof and dorade species. Fish factories do pay cash or take it on credit which is settled with a week or a month. Some factories do not pay to wholesaler and some wholesalers have gone bankrupt. Polystyrene boxes are bought the wholesalers at CFAF 1,300 for 15-kg box.
- g. High price fish is delivered on Wednesday and Sundays; and to keep this delivery, they start to collect from Monday for Wednesday delivery and from Friday for the Sunday delivery. Collectors usually get CFAF 100/kg as a commission. Wholesalers do take risk when they purchase on their own cash and sell to factories in Dakar
- h. Wholesalers supplying factories do sort out the product when they buy from fishermen because at the factory the fish is again sorted out in a more serious way. A box of 15kg takes 2.5 kg to 3 kg of ice and the rest is fish. Sometimes when they have a large quantity on the same day (400kg) they send it directly and in this case, the whole delivery is accepted because it is fresh. Sometimes they can be refused around 15 kg which they sell to retailers outside the factory. For Example : pageot generally the first and second choice are bought by the factories. Some may take the third choice, if not it is sold at a loss to the retailers. (first choice : between 300 CFA and 2000 CFA per kg. and second choice : is generally sold less than 1500 CFA maximum).
- i. Some products such as soles can be bought from fishermen and sold to the factories without being sorted out. Sometimes fishermen don't let any wholesaler or collector sort out their products (they sell in piles only ).This is in case of shortage. The product is first washed into big cold basins then packed with ice while the car is on the way to the collection point. These basins are the first steps leading to the freezing of the product for export.
- j. Wholesalers take around 2 to 3 hours to bargain and collect the product. Then they wait for one more hour for the truck to come from Dakar for collection and loading after packing.. Generally high value fish are landed in the evening. In the peak season they can start landing from 10:30 AM to 6 or 7:30 PM. Pageot is landed generally till 2:00 PM.

- k. As for the sole, since gill nets are used, wholesalers finance fishermen by giving nets. The product is sold to the wholesaler or collectors and in this case the fish is not sorted out and sold in piles.
  
- l. Small factories pay for transport about 35,000 CFA to 40,000 from Kayar to Dakar (all expenses included :driver. Large factories send their trucks to wholesalers, the transport expense are deducted accordingly. Wholesalers of sardine, usually rent large trucks of 3 to 5 tons. These trucks are rented at 25,000 CFA per trip (to and fro) and generally they transport about 1 ton to 1,5 tons per trip. Peugeot trucks (pick up ) stay at bayakh from where they are called by phone by those who want to hire them. Then they come to KAYAR to be at the disposal of the hirer. They are rented at CFAF 13,000 CFA to 15,000 CFA per trip and can take between 800 kg and 900 kg. In Kayar about seven sardine wholesalers have their own trucks. Sardine is delivered straight away to CFM or to other places around Dakar areas. When destined to Kaolack, Thies Fatick, about one third of the load are delivered on the way, but this happens scarcely. But to places as far as Touba, about 4/5 are delivered on the way.
  
- m. There is not enough ice in Kayar. Plate ice is sold here 1,000 CFA francs/40 kg (1 box). "ronier " baskets are used to carry sardine to the trucks, from where plastic boxes take over the relay for the product to reach its destination. For day time transport, 40 boxes (45 kg each) are used for a 5 tons truck, and for night time travel 15 boxes are used for the same truck.

(3) Processor group

Leaders of the group: Ishida / Nomura / Gardner / Ndiaye / Diop / Ly

Interpreter: Nata SAMB

Place: Women's Center in Kayar

Participants:

- |     |                         |                                 |
|-----|-------------------------|---------------------------------|
| 1)  | Mme. Diakhou Ndiaye     | Wholesaler                      |
| 2)  | Mme. Coumba Ndoye       | Processor                       |
| 3)  | Mme. Penda Niang        | Processor                       |
| 4)  | Mme. Ndoumbe Seck       | Processor                       |
| 5)  | Mme. Maty Ndaw          | Processor                       |
| 6)  | Mme. Sokhana Mbaye Diop | Processor                       |
| 7)  | Mme. Penda Diouf        | Processor (fruit and vegetable) |
| 8)  | Mme. Seynabou Sy        | Processor                       |
| 9)  | Mme. Codmba Ndiaye      | Wholesaler                      |
| 10) | Mme. Seynabou Ndoye     | Wholesaler                      |
| 11) | Mme. Mada Sene          | Processor                       |
| 12) | Mme. Yayou Mbaye Niang  | Processor                       |
| 13) | Mme. Nogaye Samb        | Processor                       |

Highlights of the comment:

a. The comments on the proposed plan are as follows:

- The proposed plan meets the local needs including market hall, truck road improvement, and retail market rehabilitation.
- Coordination for the people who live in the area for the proposed fishing complex needs to be considered.
- Development of the fishery sector needs to be given the first priority for the community development.
- A fish marketing complex and the fruit and vegetable processing facilities needs to be separated because fruit and vegetables are very vulnerable by the impact of fish products
- Needs and constraints in the processing infrastructure
- Concrete floor, wall, public toilet, bathroom, electricity (lighting facilities), storage for products, drainage, and garbage collection system are required to improve the sanitary conditions in the processing area.
- Equipment including drying table, bucket, knives, gloves, working dress etc. are necessary.
- Shelters from sunshine and rainfall are required.

- Emergency pharmacy is necessary in the processing area.
- Needs and constraints about the credit
- Shortage of the credit fund in the peak season: credit system which meets the local needs (seasonal fluctuation) is required.
- Complicated procedures of the credit and high illiteracy rate lessen the accessibility to the credit.
- The reimburse period should be lengthened.
- 600,000 CFA per one credit would be better for a big wholesaler's operational fund; the current credit amount of 100,000 CFA per one credit is too small. The amount of the credit should be increased.
- The credit system of CNCAS fund requires complicated procedures, long waiting time, and high interest rate. The interest rates of NGOs' credit system are relatively low but their coverage is limited.
- Needs of the BHN infrastructure improvement
  - Roads in the community needs to be improved.
  - Electricity
  - Street lights
  - Piped water
  - Public toilet facilities
  - Housing conditions

b. The comments on the Management Committee are as follows:

- Management of the proposed project should be handled by the local people who know the local needs and the fishing technology very well, supported by the DOPM experts.

### 3.3 Closing

The team leader answered questions raised by the participants and the chairman closed the meeting with thanks.



#### 4. Dakar Workshop

Date: June 23, 1997, (Monday)  
Time: 9:00 - 12:00  
Place: DOPM Conference Room, Dakar  
Chairman: Dr. Ndiaga GUEYE

#### Participants:

##### Senegalese side

- |     |                        |                                                 |
|-----|------------------------|-------------------------------------------------|
| 1)  | Ndiaga Gueye           | DOPM Director                                   |
| 2)  | El Hadj Cisse          | DOPM                                            |
| 3)  | Abibou Diagne          | DOPM                                            |
| 4)  | Ousmane Ndiaye         | DOPM                                            |
| 5)  | Kane Dioum             | DOPM                                            |
| 6)  | Kora Foba              | DOPM                                            |
| 7)  | Aboubakry Kane         | DOPM                                            |
| 8)  | Seynabou Camara Ndiaye | CAEP                                            |
| 9)  | Ndeye Ticke Diop       | DOPM                                            |
| 10) | Oumar LY               | DOPM                                            |
| 11) | A.Samba Diop           | DOPM / Kayar                                    |
| 12) | Demba E. Gning         | DOPM / Rufisque                                 |
| 13) | Babacar Ndoye          | DOPM Regional Office head of Louga              |
| 14) | Ibrahima Seck          | SRPM / Thies                                    |
| 15) | Mamadou Sy             | SRPM / Saint-louis                              |
| 16) | Ndomé Faye             | PSPS / MPTM                                     |
| 17) | Sidy Ndaw              | OEPS / MPTM                                     |
| 18) | Pape Samba Diouf       | CRODT                                           |
| 19) | Allassane Samba        | CRODT / ISRA                                    |
| 20) | Abdourahmane Diop      | CAEP / MPTM                                     |
| 21) | Pierre Sagna           | DP / Ministry of Finance & Planification        |
| 22) | Mamadou Khoule         | DCEF / Ministry of Finance & Planification      |
| 23) | Mor Mbaye              | Ministry of Interior / Head of Studies Division |

##### Japanese JICA Study Team

- 1) Tateo Kusano
- 2) Ibrahim Allahpichay
- 3) Yoko Ishida
- 4) Shigeto Nomura
- 5) Kozo Matsumura
- 6) Masahiko Watanabe
- 7) Eng Guan Tan
- 8) John W. Gardner
- 9) Sachio Yamamoto
- 10) Keiko Namiki

#### 4.1 Opening

The Director of DOPM, Dr. N. Gueye welcomed the participants and briefly explained the objective of the project. Mr. Cisse introduced the participants. Mr. Kusano took the floor to present the details of the project.

#### 4.2 Explanation of Master Plan (M/P) and Feasibility Study (F/S)

Kusano presented the outline of the Study and the development concept for the Study area. He proceeded to elaborate on the Master Plan, 6 Sector Plans, all 4 Zones Plan, and the feasibility study on the priority zones, i.e. Zone 1 St. Louis and Zone 2 Kayar. The institutional and organizational setup for the project was also explained.

#### 4.3 Comments for the presentation by Senegalese side

Comments from the Senegalese side are summarized by project items / components to which they are related to;

##### (1) Organization and Institution

Propositions concerning institutions and organization are accepted but must think about representatives to be involved as well as to avoid administrative heaviness. Therefore a limited but efficient committee is to be set.

The project should be light and realistic but there are some responsibilities of the Government which cannot be transferred. Further deliberations will need to be done to analyze the proposed institution and organization setup.

As for the organization chart of the management body of the complex, it would be better to have the communities involvement as the motto says: less state is better state.

##### (2) Project Data Base

The project data base will be useful to them because the development which is to be dealt with is at the whole levels of the fishery sector. With the project data base, DOPM can show to potential donors, because the development of the fisheries in the Northern zone is not limited to Saint Louis and Kayar.

##### (3) Saint Louis security problem

In the long term, the off-shore security problem is expected to be tackled as it will be as important as the marketing and production aspects of fisheries. Some consideration on a breakwater may be helpful.

##### (4) Community Participation

Does the projects include the socio-cultural components which are important

for the projects to be accepted fully by inhabitants?

(5) Resource Management

Marketing production and processing are insisted on in your project so much so that resources appear to be ever lasting. There should be a resource center for a better resource management.

The research post in Saint Louis is important since they have already set one in Casamance and one in Dakar.

(6) Training

Training of the technical and administrative personnel of the complex will be necessary for them to use the equipment and facilities effectively otherwise nothing will change and the infrastructures won't be useful.

Revolution of minds is needed as well as changes of behaviors for a better management of infrastructures and equipment.

4.4 Response to participants comments:

After listening to the remarks from counterparts and participants, Kusano briefly gave some general answers. He first made it clear that he would consider and take into account all the issues that were raised and focused on the following points;

(1) Production and Resources

The proposed project will generate benefits from fish production increase and quality improvement. Fish production increase is related to the deterioration of the resources and fishing modernization .

Off shore fishery development will be the key factors for the production increase. The population increase will be a cause of fish supply deficit in the future.

(2) Overpopulation in Saint Louis

It is the major problem to be solved. Promotion of resettlement is one of the major target of the proposed projects. It is important to improve the living conditions in the new resettlement areas such as Hydrobase, Kayar and satellite zone (Zone 4).

(3) Safety

In the workshops held at Saint Louis and Kayar, fishermen and officers requested a break water system. It is very costly and detail survey was not included in S/W of the study. Instead, the project will contribute to the security control by setting up of a lighthouse and other small scale facilities.

(4) Project Sustainability

Institution and organization for the project management are too complicated and huge for the proposed project. Size of the project and its components will be

reconsidered taking into account the management's abilities.

(5) Project Scale

The project scale will be adjusted considering the availability of human and financial resources.

4.5 Conclusion by Director of DOPM

He commented that the meeting was very fruitful and useful. Not all problems will be solved by the project but the improvement of the living and working conditions are necessary. Attendants have learned a lot. Now both sides have to work closer in order to finalize well this study.

**Appendix 2**

**NATURAL CONDITION SURVEY,  
AND  
ENVIRONMENTAL IMPACT ASSESSMENT REPORT**

## NATURAL CONDITION SURVEY

<b>1. CLIMATIC CONDITIONS.....</b>	<b>E1-1</b>
1.1 TEMPERATURE .....	E1-1
1.2 RELATIVE HUMIDITY.....	E1-1
1.3 RAINFALL .....	E1-1
1.4 WIND DIRECTION AND WIND SPEED .....	E1-2
<b>2. SEA CONDITIONS.....</b>	<b>E1-2</b>
2.1 TIDE.....	E1-2
2.2 WAVES.....	E1-3
2.3 WAVES IN ST. LOUIS AND KAYAR.....	E1-3
<b>3. TOPOGRAPHY .....</b>	<b>E1-4</b>
3.1 LANDSCAPE.....	E1-4
3.2 SEA BOTTOM.....	E1-4
3.3 SEASONAL FLUCTUATION OF THE BEACH.....	E1-4
3.4 SAND DRIFT.....	E1-4
3.5 VOLUME OF LITTORAL DRIFT .....	E1-4
<b>4. WAVE RUN-UP.....</b>	<b>E1-4</b>

## Natural Condition Survey

### 1. Climatic conditions

St.Louis and Kayar are located in 175km and 20km distance from Dakar ,capital of Senegar, north-easterly . Those are belonging to "Niayes" climatic zone. The rainy season is from June to October and dry season is from November to May. This areas are not affected by tropical cyclones.

Observation data of ST.Louis air port are used for the site in St.Louis. As there is no observatory station in Kayar, observation data of Dakar Yoff are used as the climatic conditions for the project site of Kayar.

#### 1.1 Temperature

Table-1.1.1, 1.1.2 shows monthly average temperature and average of maximum and minimum temperature during the past 10 years (1986-1995) in St.Louis and Kayar.

The annual range for the average temperature is about 5°C in St.Louis ,and about 7°C in Kayar. The seasonal change of temperature is rather small throughout the year.

Table-1.1.1 Monthly Temperature (St. Louis) (°C)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUT	SEP	OCT	NOV	DEC
Maximum	16.3	17.1	17.5	18.1	19.4	22.4	24.5	24.9	25.3	24.8	20.0	17.9
Minimum	30.0	31.1	31.1	30.3	29.6	29.7	30.2	31.5	32.3	32.7	33.7	31.3
Average	23.2	24.2	24.3	24.2	24.5	26.1	27.4	28.2	28.8	28.8	26.9	24.5

Source: Direction De La Meteorologie Nationale

Table-1.1.2 Monthly Temperature (Kayar) (°C)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUT	SEP	OCT	NOV	DEC
Maximum	18.2	17.5	17.4	18.5	19.9	22.6	24.5	24.9	24.8	24.6	22.4	20.3
Minimum	25.4	24.4	24.0	24.4	25.5	28.0	29.7	30.0	30.5	30.7	29.5	27.5
Average	21.8	21.0	20.7	21.5	22.7	25.3	27.1	27.5	27.7	27.7	26.0	23.9

Source: Direction De La Meteorologie Nationale

#### 1.2 Relative humidity

Table-1.2.1 and 1.2.2 show the monthly average of relative humidity in St.Louis and Kayar.

In both place, relative humidity is high during August to September, and is low during December to January. But the monthly change are small.

Table-1.2.1 Monthly average of relative humidity (%) (St.Louis)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUF	SEP	OCT	NOV	DEC	AVE
Maximum	67	75	82	87	87	92	91	93	94	91	85	74	85
Minimum	25	27	31	39	48	60	66	68	64	45	36	41	46
Average	46	51	57	63	68	76	79	81	79	68	61	58	65

Source: Direction De La Meteorologie Nationale

Table-1.2.2 Monthly average of relative humidity(%) (Kayar)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUF	SEP	OCT	NOV	DEC	AVE
Maximum	87	91	92	93	92	91	88	91	93	92	89	86	90
Minimum	45	54	57	66	67	68	68	71	69	65	53	44	61
Average	66	73	75	80	80	80	78	81	81	79	71	65	76

Source: Direction De La Meteorologie Nationale

#### 1.3 Rainfall

Table-1.3.1, 1.3.2 show the monthly average of rainfall, rainy days and maximum rainfall in a day during observatory terms. The annual rainfall is about 230mm in St.Louis and 330mm in Kayar. The fluctuation of annual rainfall is 100mm~300mm in

St.Louis, and 200mm~450mm in Kayar. The maximum rainfall per day is recorded as 132.4mm in St.Louis and 144.2mm in Kayar.

Table-1.3.1 Monthly Rainfall (St.Louis)

93'-96'	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUT	SEP	OCT	NOV	DEC	Total
Rain fall(mm)	0.0	0.8	0.3	0.0	0.0	3.5	17.8	84.8	109.6	11.9	0.3	0.0	229.0
Rain days	0.0	0.5	0.5	0.0	0.0	1.0	3.0	9.0	7.5	2.8	0.3	0.0	24.6
Max of rainfall/day		2.2	1.1			9.4	16.2	54.7	132.3	15.8	1.2		

Source: Direction De La Meteorologie Nationale

Table-1.3.2 Monthly Rainfall(Kayar)

92'-96'	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUT	SEP	OCT	NOV	DEC	Total
Rain fall(mm)	0.2	0.8	0.0	0.0	0.1	3.1	50.3	146.8	103.2	6.3	0.1	0.2	328.6
Rain days	0.4	1.0			0.2	0.6	6.4	13.0	9.6	1.0	0.2	0.2	32.6
Max of rainfall/day	0.7	3.7			0.6	11.2	42.4	68.6	144.1	15.0	0.3	1.2	

Source: Direction De La Meteorologie Nationale

#### 1.4 Wind direction and wind speed

Table-1.4.1, 1.4.2 show the monthly average of wind speed and direction during the past 10 years. As shown in the tables, the predominant wind direction in both sites is northwesterly(NW) to north(N) throughout the year.

Although the monthly average wind speed is almost constant and, which is between 3 and 5m/sec,the tendency is that wind speed in the rainy season is weak and that it is strong in the dry season. The maximum wind speed was recorded as 27m/sec in St.Louis and 32m/sec in Kayar.

Table-1.4.1 Monthly wind direction and average wind speed(St.Louis)(m/sec)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUT	SEP	OCT	NOV	DEC
Speed	4.0	4.4	4.9	5.8	5.5	4.9	4.5	4.0	3.6	3.7	3.7	3.6
Direct ion	NE	N	N	N	N	NW	NW	W/NW	NW	N	N	NE

Source: Direction De La Meteorologie Nationale

Table-1.4.2 Monthly wind direction and average wind speed(Kayar)(m/sec)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUT	SEP	OCT	NOV	DEC
Speed	5.0	5.2	5.3	5.4	4.7	3.9	3.6	3.0	2.9	3.7	4.6	5.2
Direct ion	N	N	N	NNW	NNW	NW	WNW	WNW	NW	NNW	N	NNE

Source: Direction De La Meteorologie Nationale

## 2. Sea conditions

### 2.1 Tide

Tidal conditions in St.Louis are mentioned below. In Kayar they are same conditions, as St.Louis and Dakar are same tidal conditions.

H.H.W.L.	+1.90 m
H.W.L.	+1.60 m
M.H.W.L.	+1.30 m
M.S.L.	+1.00 m (I.G.N.=0.00m)
M.L.W.L.	+0.70 m
L.W.L.	+0.40 m
L.L.W.L.	+0.10 m
C.D.L.	0.00 m



## 2.2 Waves

### 2.2.1 Offshore Wave characteristics

Since there is no observation station near both sites in St.Louis and Kayar, wave observation data are not available. We therefore obtained the data for St.Louis and Kayar hindcast offshore waves by taking from the U.S.Navy Operational Spectral Ocean Wave Model Data Base.

The frequency of occurrence of offshore waves by height, direction and period are shown in Table-2.2.1 ~ 3. The relations between wave direction and wave height are shown in table-1 of Appendix. According to the result, northerly (N) to north-westerly(NW) waves predominate at about 90%. The waves 1 meter or less in the height account for 27%, and those 1 and 2 meters 47%. The waves 2 meters larger in the height account more than 25%. According to the Appendix table-2, calm season is July to September. In these months, the occurrence rate of waves 1 meter or less in the height is high.

### 2.2.2 Offshore design waves

By statistically processing the above offshore wave data, Weibull distribution was obtained and the non-exceedance probability of waves calculated. The wind speed, wave height and period for each return period were calculated. Table-2.2.4 shows the wave dimensions broken down by the return period. The wave with a return period of 30 years was applied in design for fishing port facilities and the dimensions of the offshore design waves are shown in Table-2.2.5.

Table-2.2.4 Dimensions of offshore waves by return period

Return period (year)	Wind speed (Knots)	Wave height H1/3(m)	Period T1/3(sec)
1	28	4.4	9.6
10	30	5.1	11.4
25	31	5.3	13.0
30	31	5.4	13.9
50	31	5.5	14.8

Table-2.2.5 Dimensions of offshore Design Waves

Offshore Wave Direction	NW	NNW
Wave Height $H_0$ (m)	5.4	5.4
Wave Length $L_0$ (m)	305.8	305.8
Wave Steepness $H_0/L_0$	0.018	0.018

## 2.3 Waves in St.Louis and Kayar

Offshore waves reach to the shallow area offing from St.Louis and Kayar after being by refraction due to the sea bottom topography. The equivalent deepwater wave height at the offshore of the sites was calculated by computing wave deformation using energy balance equation. The results of wave deformation calculation are shown in Table-2.2.6.

Table-2.2.6 Dimensions of offshore Design waves

	St.Louis		Kayar	
	NW	NNW	NW	NNW
Wave direction				
Wave height $H_0$ (m)	5.40	5.40	5.40	5.40
Refraction coefficient (Kr)	0.83	0.74	0.61	0.63
Equivalent deepwater wave height $H_0'$ (m)	4.50	3.80	3.29	3.40

### 3. Topography

#### 3.1 Landscape

Topographic survey was conducted at the both sites. The site of St.Louis is on the sand bar with about 300m width developed along the Senegar River called "LANGUE DE BARBARIE".

The profile of the site is that the top of land is about +4.30m I.G.N., then gradually goes down toward sea. Its slope is about 1/75 and slope of swash zone is about 1/20. At the foreshore, sea cliff with about 0.8m height was occurred by waves during site survey.

In Kayar, the profile of the beach is almost same as St.Louis.

#### 3.2 Sea bottom

There is no bottom sounding data in St.Louis and Kayar. According to the marine chart, bottom slope from 0m to 10m depth is 1/75 in St.Louis, and it becomes more gentle slope less than 1/100 from 10m depth. In Kayar, it is characteristic of sea valley reaching to near the beach, but the both side of the valley shows gentle slope same as St.Louis.

#### 3.3 Seasonal fluctuation of the beach

Beach profile fluctuation is shown in Fig-3.3.1 conducted in the study of St.Louis port development plan. The portion of foreshore was fluctuated. The seasonal fluctuation of beach width was 20m to 50m. Beach width became wider in rainy season than dry season.

#### 3.4 Sand drift

##### Littoral current

Predominant direction of littoral current is toward south. Because the waves, mainly from N-NW, generate southward current. The average and maximum current speed observed in the past was reported such as 0.1-0.15m/sec and 0.4m/sec, respectively.

#### 3.5 Volume of littoral drift

Predominant direction of littoral drift is same as littoral current. The volume of sand drift was reported as 1,000,000m<sup>3</sup> per each year. The maximum and minimum were 1,500,000m<sup>3</sup> and 600,000m<sup>3</sup> respectively.

### 4. Wave run-up

Table-4.1 shows wave run-up height (Rmax) calculated by each return period. According to the result, waves will reach to the top of the land in return period 30 years.

Table-4.1 Wave run-up height by each return period

	Return period (year)	H <sub>0</sub> (m)	H <sub>0</sub> ' (m)	Rmax(m)
St.Louis	30	5.40	4.50	5.00
	10	5.10	4.20	4.30
	1	4.40	3.70	3.50
Kayar	30	5.40	3.40	4.50
	10	5.10	3.20	3.70
	1	4.40	2.80	3.00

Table-2.2.1 SIGNIFICANT WAVE HEIGHT (METERS) / TOTAL WAVE DIRECTION (DEGREES) -- PERCENT OCCURRENCE

MODIFIED U.S. NAVY OPERATIONAL SPECTRAL OCEAN WAVE MODEL DATA BASE

14 2N 18 ON  
10/10/75 6/23/85

ANNUAL

SIGNIFICANT WAVE HEIGHT (METERS) CALX	TOTAL WAVE DIRECTION (DEGREES)								NNW	TOTAL						
	N	NNE	NE	E	ESE	SE	SSE	S			SSW	SW	WSW	W	WNW	NNW
> 0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
> .0 <= .5	2.5	0.5	0.6	*	-	*	*	*	*	*	*	0.1	0.2	1.0	0.9	6.0
.5 <= 1.0	8.8	0.7	0.5	*	*	*	-	0.1	0.1	0.1	-	-	0.2	4.7	5.9	21.3
1.0 <= 1.5	10.2	1.8	0.4	-	-	-	-	0.1	0.1	0.1	*	*	0.3	4.1	8.1	25.5
1.5 <= 2.0	9.9	1.8	0.2	-	-	-	-	-	*	*	*	*	0.4	3.1	6.4	21.9
2.0 <= 2.5	6.8	0.5	0.2	-	-	-	-	-	-	-	-	*	0.2	2.5	3.8	14.0
2.5 <= 3.0	3.0	0.1	*	-	-	-	-	-	-	-	-	-	*	1.6	1.8	6.6
3.0 <= 3.5	1.5	-	-	-	-	-	-	-	-	-	-	-	-	0.9	0.8	3.2
3.5 <= 4.0	0.5	-	-	-	-	-	-	-	-	-	-	-	-	0.3	0.2	1.0
4.0 <= 4.5	0.1	-	-	-	-	-	-	-	-	-	-	-	-	0.2	*	0.4
4.5 <= 5.0	*	-	-	-	-	-	-	-	-	-	-	-	-	0.1	*	0.1
5.0 <= 5.5	-	-	-	-	-	-	-	-	-	-	-	-	-	*	-	-
5.5 <= 6.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.0 <= 6.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.5 <= 7.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.0 <= 7.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.5 <= 8.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8.0 <= 8.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8.5 <= 9.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.0 <= 9.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.5 <= 10.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
> 10.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	43.7	5.5	2.0	0.1	-	-	-	0.2	0.3	0.3	0.1	0.2	1.3	18.5	27.9	100.0

NUMBER OF OBSERVATIONS: 11486  
(NOTE: \* = < .05 PERCENT)

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Table-2.2.2 SIGNIFICANT WAVE HEIGHT (METERS) -- CUMULATIVE PROBABILITY OF OCCURRENCE (PERCENT OCCURRENCE)

MODIFIED U.S. NAVY OPERATIONAL SPECTRAL OCEAN WAVE MODEL DATA BASE  
 14.2N 18.0W  
 10/10/75 6/23/85

VALUES <=	.0	.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5	10.0	TOTAL OBS	
JANUARY	.0	4.8	18.7	44.7	71.1	88.4	95.1	97.9	99.1	99.8	100	100	100	100	100	100	100	100	100	100	100	100	1011
FEBRUARY	.0	2.9	12.2	34.5	58.1	77.1	86.9	95.6	98.4	99.8	100	100	100	100	100	100	100	100	100	100	100	100	967
MARCH	.0	1.2	6.2	18.5	46.6	70.7	86.6	96.4	99.2	100	100	100	100	100	100	100	100	100	100	100	100	100	726
APRIL	.0	1.4	5.7	19.8	44.6	67.3	82.9	94.2	98.3	99.5	100	100	100	100	100	100	100	100	100	100	100	100	813
MAY	.0	.0	4.6	28.1	55.3	81.4	95.9	99.3	99.8	100	100	100	100	100	100	100	100	100	100	100	100	100	1075
JUNE	.0	3.5	26.5	56.7	84.6	96.2	99.3	99.7	100	100	100	100	100	100	100	100	100	100	100	100	100	100	1025
JULY	.0	4.7	45.3	77.3	93.5	99.3	99.5	99.6	99.8	99.9	100	100	100	100	100	100	100	100	100	100	100	100	1013
AUGUST	.0	13.8	54.7	87.1	96.8	99.3	99.9	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	817
SEPTEMBER	.0	17.6	62.6	87.4	96.1	99.5	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	961
OCTOBER	.0	3.9	36.9	67.8	87.3	96.0	98.8	99.8	99.9	100	100	100	100	100	100	100	100	100	100	100	100	100	981
NOVEMBER	.0	13.1	35.0	61.3	82.2	94.4	97.9	99.5	99.9	100	100	100	100	100	100	100	100	100	100	100	100	100	1021
DECEMBER	.0	4.7	17.3	43.8	72.1	87.6	95.9	98.5	99.3	99.7	99.9	100	100	100	100	100	100	100	100	100	100	100	1076
ANNUAL	.0	6.0	27.3	52.8	74.7	88.7	95.2	98.5	99.5	99.9	99	100	100	100	100	100	100	100	100	100	100	100	11486

NUMBER OF OBSERVATIONS: 11486  
 (NOTE: 1.7% = < .05 PERCENT) PREPARED BY: OCEANROUTES, INC.

DATA WITHIN A COLUMN ARE EQUAL TO OR LESS THAN THE NUMERICAL COLUMN HEADING  
 AND GREATER THAN THAT OF THE ADJACENT LEFT COLUMN.

15 MAY 97

Table-2.2.3 SIGNIFICANT WAVE HEIGHT (METERS) / TOTAL MEAN PERIOD (SECONDS) -- PERCENT OCCURRENCE

MODIFIED U.S. NAVY OPERATIONAL SPECTRAL OCEAN WAVE MODEL DATA BASE  
 14.2N 18.0W  
 10/10/75 6/23/85

ANNUAL

SIGNIFICANT WAVE HEIGHT (METERS)	TOTAL MEAN PERIOD (SECONDS)										TOTAL							
	0	2	4	6	8	10	12	14	16	18		20	22	24	26	28	30	> 30
> 0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.0 <=	-	-	-	1.2	1.6	1.7	0.9	0.3	0.2	*	*	-	-	-	-	-	-	6.0
0.5 <=	-	-	0.2	6.3	9.1	4.0	1.1	0.4	0.1	*	*	-	-	-	-	-	-	21.3
1.0 <=	-	-	0.2	7.3	13.3	3.3	1.0	0.3	0.1	*	*	-	-	-	-	-	-	25.5
1.5 <=	-	-	-	2.9	15.9	1.9	0.6	0.4	0.1	0.1	-	-	-	-	-	-	-	21.9
2.0 <=	-	-	-	0.4	10.9	1.8	0.5	0.1	0.2	0.1	-	-	-	-	-	-	-	14.0
2.5 <=	-	-	-	*	4.6	1.4	0.4	0.1	0.1	*	-	-	-	-	-	-	-	6.6
3.0 <=	-	-	-	-	1.9	0.9	0.3	*	*	*	-	-	-	-	-	-	-	3.2
3.5 <=	-	-	-	-	0.3	0.6	0.1	*	*	-	-	-	-	-	-	-	-	1.0
4.0 <=	-	-	-	-	-	0.2	0.1	0.1	*	-	-	-	-	-	-	-	-	0.4
4.5 <=	-	-	-	-	-	-	0.1	*	*	-	-	-	-	-	-	-	-	0.1
5.0 <=	-	-	-	-	-	-	-	*	*	-	-	-	-	-	-	-	-	-
5.5 <=	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.0 <=	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.5 <=	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.0 <=	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7.5 <=	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8.0 <=	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8.5 <=	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.0 <=	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.5 <=	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
> 10.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	-	-	-	1.5	18.6	57.6	15.1	4.5	1.7	0.7	0.3	-	-	-	-	-	-	100.0

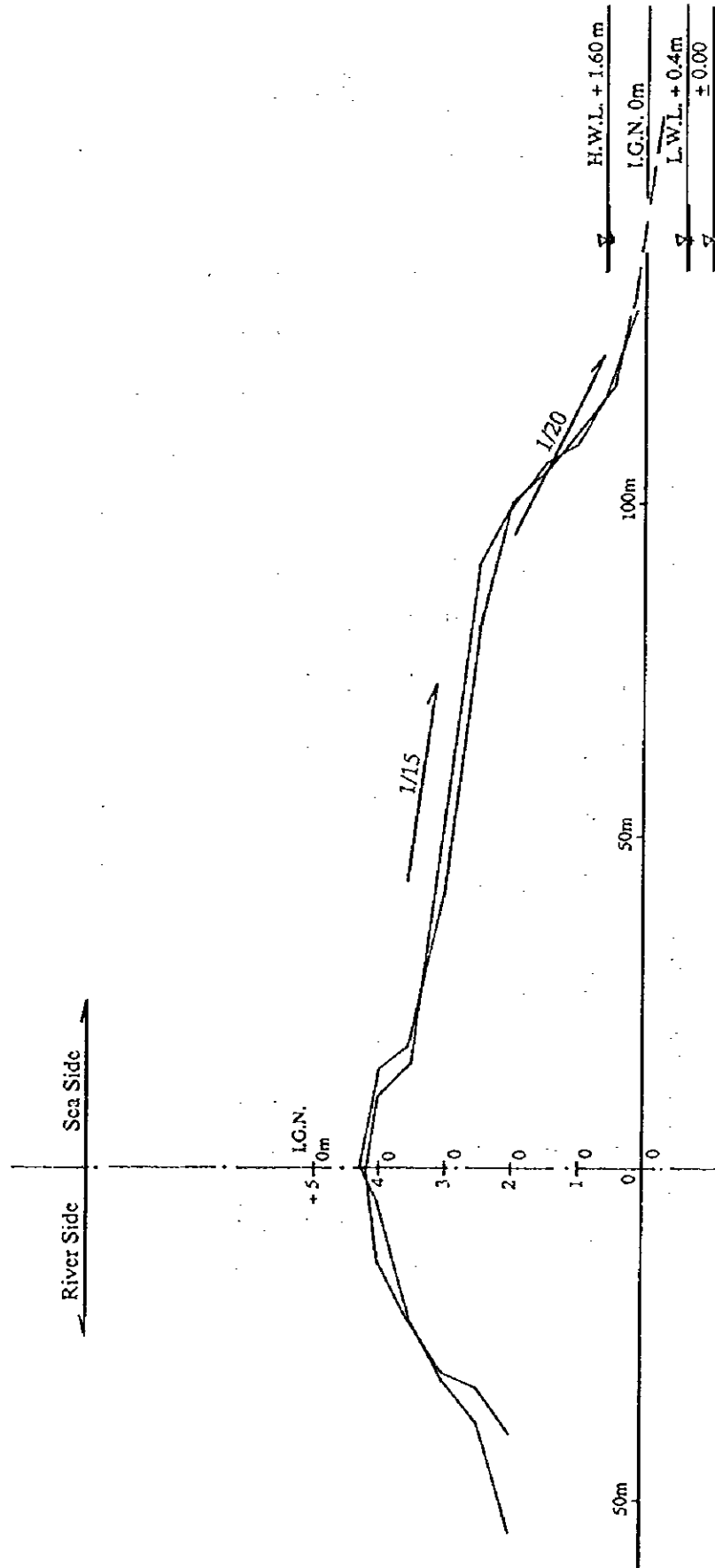
NUMBER OF OBSERVATIONS: 11486  
 (NOTE: \*\* = < .05 PERCENT)

PREPARED BY: OCEANROUTES, INC.

DATA WITHIN A COLUMN ARE EQUAL TO OR LESS THAN THE NUMERICAL COLUMN HEADING AND GREATER THAN THAT OF THE ADJACENT LEFT COLUMN.

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Fig-3.3.1 Beach Profile at the Proposed Site in Saint Louis



**EIA REPORT  
FOR  
THE STUDY ON THE DEVELOPMENT PROGRAM  
FOR NORTHERN FISHING AREAS  
IN THE  
REPUBLIC OF SENEGAL**

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**ATTACHMENT**

1. Topographic survey map of Saint Louis
2. Topographic survey map of Kayar

The following table shows the results of the regression analysis. The dependent variable is the log of the ratio of the number of employees to the number of establishments. The independent variables are the log of the number of establishments, the log of the number of employees, and the log of the number of establishments per employee. The results show that the number of establishments is positively correlated with the number of employees, and the number of establishments per employee is negatively correlated with the number of employees.

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# ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

## 1. SUMMARY

The Initial Environmental Examination (IEE) was undertaken in Phase 1 to identify the potential significant impacts of the proposed project in Saint Louis and Kayar. An approved checksheet was developed listing the proposed activities and the physical and social environment that may be impacted upon by those activities. The significant impacts identified on the checksheet were then used to scope the survey items for the Phase 2 Environmental Impact Assessment (EIA).

The objectives of the EIA were:

- Identification and prediction of potential impacts of project components on the physical and living environment (social, economic and environmental aspects)
- Assessment of project impacts (Short Term, Long Term, Direct, Indirect, Local, Strategic, Adverse, Beneficial impacts)
- Recommendation to avoid, mitigate, lessen or eliminate impacts.

To collect baseline data, a local consultant was engaged to undertake soil, traffic, water, and social surveys in Saint Louis and Kayar.

## 2. THE PROJECT

EIA was carried out on the priority projects at Saint Louis and Kayar.

The project components are related to the six sectors, i.e.

- Sector 1 - Production / Resource
- Sector 2 - Marketing / Distribution
- Sector 3 - Artisanal Processing
- Sector 4 - Community Development
- Sector 5 - Education / Training
- Sector 6 - Institutional Building

It is proposed to build a fisheries complex at the Saint Louis and Kayar project sites to accommodate a landing apron on the beach, market hall, repair workshops, truck parking berths, fishermen gear repair and storage space, fishery management and training building, ice-making plant, cold storage facilities, fish sorting area, fuel dispensing area, and improvement of existing fish processing yard. Improvement of some social infrastructure was also proposed.

## 3. EIA METHODOLOGY

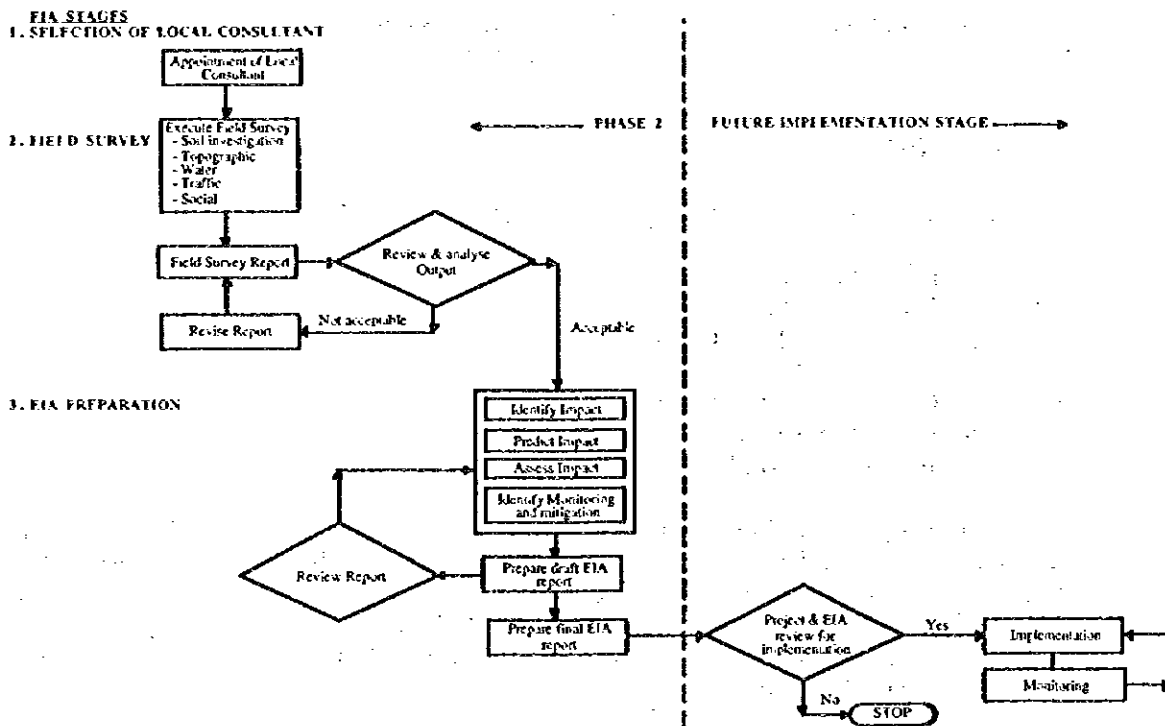
### 3.1 EIA Process

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 & 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



### 3.2 Physical Impact Surveys

#### 3.2.1 Soil Investigation

##### Methodology

At each of the project sites, 2 boreholes were done and soil samples were taken for laboratory analysis. Dynamic penetration test was also conducted.

#### Objective of Soil Investigation Survey

- To determine the soil characteristics.
- To determine soil bearing capacity.
- To determine if there are any unstable or corrosive ground environment that may need special precaution.

### **3.2.2 Topographic Survey**

#### Methodology

Ground elevation survey was conducted be at 10 m grid interval over the entire project sites and surrounding areas (including beach area up to low tide mark). Survey was done with reference to the IGN (Institute Geographical National) bench mark.

#### Objective of Survey

- To map out the position and size of existing buildings, structures, obstructions, vegetations, drainage pipes/channels, electricity / telephone/ other services.
- To delineate the project sites' boundaries on the survey drawing and to mark the boundaries by corner stones at the project sites.
- To determine the need for site preparation in terms of trees to be cut, demolition or relocation of existing structures, and areas of cut and fill.

### **3.2.3 Water Survey**

#### Methodology

Existing pipe water quality & pressure tests were undertaken at Saint Louis and well water samples at Kayar were taken for laboratory analysis. Boreholes data from existing wells and hydrological studies were collected and analyzed.

#### Objective of Survey

- To determine the quality of the water from the chemical and biological aspects.
- To determine the supply capacity of the pipe water at Saint Louis.
- To determined the capacity of existing wells and risk of salinity intrusion at Kayar.

### **3.2.4 Traffic Impact Survey**

There was 2 types of traffic survey. One was to count the traffic volume and the other was a questionnaire survey to grasp the transportation pattern and system.

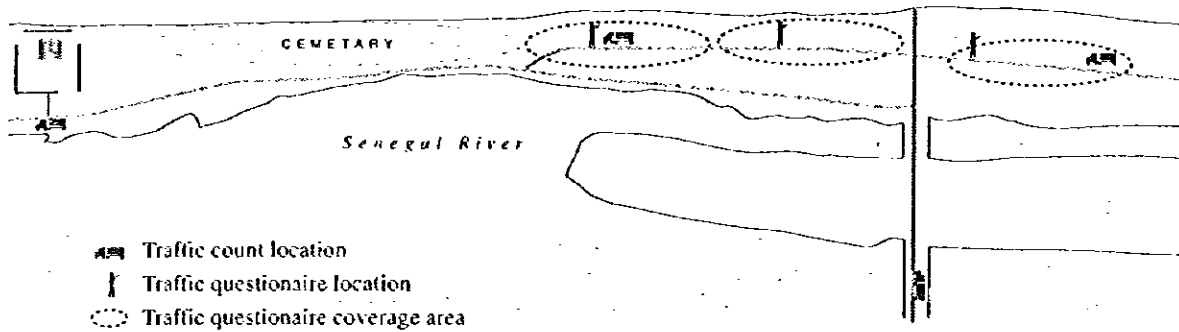
#### Methodology

The diagrams below indicate the positions of the traffic count locations and the area coverage of the traffic questionnaire survey. The traffic count survey was for 24 hours and for a period of 7 days.

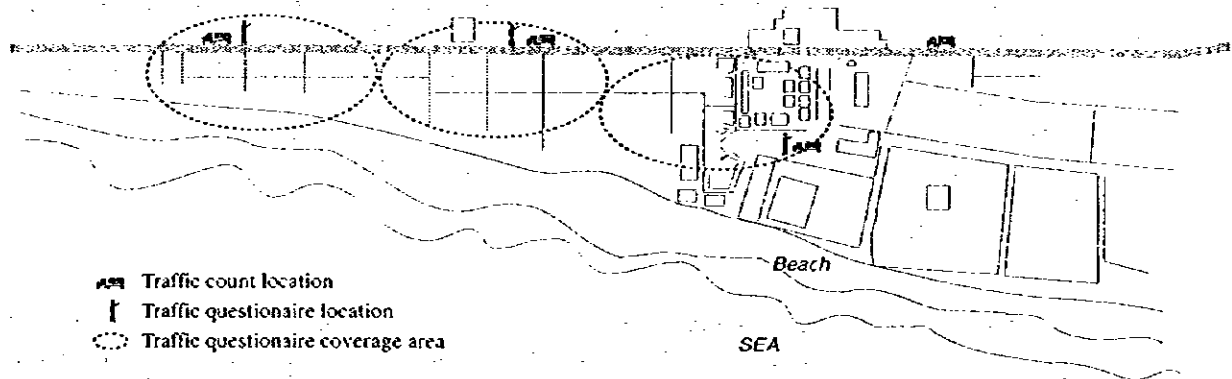
The questionnaire survey was conducted in 3 areas in each of the project area over a 7 days period. The target of the survey are all modes of transport with relation to the fisheries activities.

To correlate the traffic survey results with existing regional traffic data & DOPM's marketing data to grasp monthly & yearly pattern of traffic flow for the study area.

### St. Louis Traffic Survey



### Kayar Traffic Survey



#### Objective of Survey

The objectives of the traffic count survey are:

- To clarify existing vehicle flow frequency and direction
- Use as baseline data for predicting future traffic flow and traffic impact of the project's component

The objectives of the traffic questionnaire survey are:

- To clarify existing fish collection/ice supply/marketing system in the project area
- Use as baseline data for predicting future traffic flow and traffic impact of the project's component

### **3.3 Social Impact Surveys**

There are 3 principal types of questionnaires and a minor questionnaire that targets ice vendors and boat builders. The 3 principal questionnaires are:

#### Questionnaire Type

1. Household
2. Groups
3. Quarter / Village

#### Target

- Individual Households  
GIEs, professional associations / groups  
Chief of Quarter or village

Sample size of the questionnaires are;

Type of Questionnaire	Sample Size	
	Saint Louis	Kayar
1. Household	165	86
2. Groups	15	8
3. Quarter / Village	10	1
4. Ice Vendors / Mechanics	5	3
5. Boat builders	5	2
Total	200	100

#### Objective of Questionnaires

- To clarify the social demographic situation of the project area
- To clarify the social economic condition of the inhabitants
- Opinion of the target groups regarding the project
- Willingness to participate in project activities
- Willingness to pay for the services provided in the new fisheries centre
- Willingness to relocate business to new area

## 4. FINDINGS FROM ENVIRONMENTAL SURVEYS

### 4.1 Project Site in Saint Louis

For Saint Louis, the proposed site is located on DOPM's land in an area called Hydrobase on Langue de Barbarie, a sand-bar formed between the Senegal River and the Atlantic Ocean. Langue de Barberie is connected to the Saint Louis island by 2 bridges, one of which is only for pedestrians.

To the north of the project site lies the villages of Gokhu Mbath, Ndar Toute, and Guet Ndar, the cemetery and a field. The total population of these villages is about 35,000. To the south of the project site, there is a new village development with about 400 housing lots but only about 50 houses are presently built, an ice plant / cold storage factory, and hotels (Hotel Mermoz, Hotel Oasis, Hotel Cap Saint Louis and a camping hotel). To its west is the beach and the Atlantic Ocean, and to its east is the road and then the Senegal River.

#### 4.1.1 Soil Investigation

##### Dynamic penetration test

From the analysis of the penetrometer diagrams, we observed the following:

- The evolution of the resistance to the dynamic penetration shows the presence of three stratas which resistance are expressed as follows : from 0.00 to 1.00 m the average resistances are 6MPa for PD<sub>1</sub>, 4 MPa for PD<sub>2</sub>, 1.5 MPa for PD<sub>3</sub> and PD<sub>4</sub>.
- Over 2 m, the resistance to penetration is very irregular for PD<sub>1</sub> and PD<sub>2</sub>, however it remains in the region of 7 to 20 MPa for PD<sub>1</sub> and 6 to 1.5 MPa for PD<sub>2</sub>. Over 4.9 m the resistances vary but still are around 10 and 30 MPa. It is common to apply the rule of the 20th for this type of material to the peak dynamic resistances for a possible estimation of the admissible load (charge). In PD<sub>3</sub> and PD<sub>4</sub> the resistance grows almost continuously from 2 m to 4.9 m where it reaches 10.3 MPa in PD<sub>3</sub> and 22 MPa in PD<sub>4</sub>.

##### N Values

The stratigraphy was quite simple with only sands and sometimes shelly sands. The interpretation of the results must be done regarding the following correlations between N value and the compactness of the sand.

- 4 < N < 10 = little compact sand
- 10 < N < 30 = moderately compact sand
- 30 < N < 50 = compact sand
- N < 50 = very compact sand.

Since N varies generally from 10 to 85 on the whole depth of the test, the analysis of the results shows that we have here moderately compact to compact sands.

### Laboratory Tests

#### (1) Specific gravity

The specific gravities vary from 1.48 to 1.57 T/m<sup>3</sup> which give soils with quite satisfying density.

#### (2) Water content

The water contents vary between low and quite high content, that's to say between 3 and 14.8 %. This corresponds between 11 and 50 %.

These saturation degrees should be higher because of the presence of the aquifer. The low values can be explained by the permeability of the soils, which entails also a leaking of the water during the transportation of the samples to the laboratory.

#### (3) Sand equivalent (SE)

The sand equivalent tests gave rates between 41 and 86 % and testify the presence of relatively clean and very clean sands.

#### (4) Grain Size Distribution

We have here moderate granulometry sands, with grain sizes generally between 0.1 and 0.5 mm. Those sands can sometimes contain unrefined elements.

The grains with  $\phi$  0.3 ~ 0.5 mm diameter vary between 98 and 83 %. The grains greater than  $\phi$  0.5 mm diameter present a maxima percentage of 3 %.

#### (5) Chemical analysis of the waters of the aquifer

The proximity of seawaters led us into making chemical analysis of the water samples taken from the targeted aquifer, during the sampling (borings). This makes it possible to assess the aggressivity of the water. The analysis consist in evaluating the PH, the chloride and sulphate contents.

The results of the tests show an average PH of 7.96, chloride and sulphate contents respectively equal to 1,650 and 272 mg/l, which shows a very high chloride content.

### Mechanical characteristics

#### (1) Shear tests

The shear test made on the samples, showed the following characteristics :

- the angle of repose varies between 30 and 33°
- the adhesion varies between 0.00 and 0.08

#### (2) Compressibility

The compressibility tests (oedometer) made on the sand samples enable us give consolidation pressures between 0.08 and 0.130 MPa. The compressibility coefficients (0.0428 < C<sub>c</sub> < 0.051) shows that the soil stratas are very little compressible.

### Subsidence

The calculation of the subsidence is done on one isolated base plate pad of 2.50 x 2.50 founded at 2.5 m level with a surcharge of 0.2 Mpa. The detailed calculations in the annex give an subsidence amplitude that does not exceed 1.5 cm.

## **Conclusion**

We noticed that the proposed site for the project in Saint-Louis is essentially made of moderately compact and very compact sands down to 20 m. The geotechnical quality of the site makes it possible to take the option of a shallow foundation.

Considering the configuration of the land and the resistance characteristics of the soils, the projects foundations level can be chosen from 2.50 m deep.

The aquifer is met at some 1 m and shows waters with a high chloride content, this can be explained by the salt intrusion because of the nearness of the sea (some 10 m far). It is highly recommended, in the presence of waters with a high chloride content to use a very good quality cement (CHF type) for the foundations.

The assessment of the admissible load through SPT and the mechanical characteristics of the soil gave a minimal value of 0.27 MPa. This result remains satisfactory compared to the minimal load estimated to 0.20 MPa. We also made sure that for a 0.2 MPa surcharge the subsidence amplitudes estimated for one square base plate pad of 2.50 x 2.50 will not exceed 1.5 cm.

## **4.1.2 Topographic Survey**

### **Reference Station**

The reconstruction of the TF 904 (Saint-Louis site) was carried out with the XY coordinates of S4 and 25 114 (which are given in the section joined hereafter and which is available at the regional cadastre office in Saint-Louis).

For the leveling we started from the reference bench mark located at about 1.5 km from the site, inside COFRINORD (the ice plant). This reference bench mark is located at the south - west corner of the building, its mark level is 2.35 m.

### **Site Levels**

The profile of the site is that the top of the forested area is about +4.30m I.G.N., then gradually slopes down towards the sea. Its slope is about 1/75 and slope of swash zone is about 1/20. At the foreshore, sea cliff with about 0.8m height created by waves was observed during site survey. The area between the main road and DOPM office is on the average about +1.8 ~ 2 m I.G.N.

### **Existing Structures / Obstructions**

The design level of the Market Hall at + 4.00 m I.G.N. on the highest point of the site will mean that some trees will need to be cut to make way for the structure.

Generally the cut and fill will be about equal and there will not be any need to import or export any substantial amount of soil material.

Existing structures that will need to be demolished to make way for the project components are the DOPM office, the small building to the north of DOPM office, and the Aquarium building.

## **4.1.3 Water Survey**

### **Drinkable Water Supply**

Drinkable water in Guet Ndar is supplied through the water convergence network of SDE. This water comes from the Senegal River.

Wells in the houses are used to wash the dishes and cook. Sometimes, they are used as drinkable water when the SDE network breaks down. According to the information we received from the nurse in the Guet Ndar clinic in Saint-Louis, the most frequent diseases are diarrhea, intestinal parasitosis, mangy, malaria and cholera. The person in charge of the clinic did not manage to give us the number of sick in comparison with the number of persons who have been consulted.

### **Hydrochemical & Microbiological aspects of Wells n° P1, 2, 9 and 10**

**P1** - Located at 400 m in the North of the wall of the cemetery, in Dack district and at 60 m of the tarred road. It is located at 2.5 m of the latrines.

**P2** - The well is located in the house of the late Coura Gueye Dieye Sarr or Fatou Diouf. The piece of work which is located at Gandji Dièye street is at 110 m in the north of P1.

**P9** - It corresponds to the well located at 1 km from the Governor's office, 10 meters above P7 on the Mame Mbaye Fara Birame road called Rue du Porteau. P9 is at 1 meter from the latrines

**P10** - Corresponds to the well located in Mame Mbaye Fara Birame called Rue du Poteau. The well is inside the mosque. The works consisting in digging again the wall were just completed when we arrived. The work contains some nauseating water. It is about 40 - 50 meters from the sea and 100 meters from P9

The chemical analysis show that the pH is between 7 and 7.3. According to EEC (European Union) standards, we must have  $6.5 < \text{PH} < 8.5$  and the maximal accepted content is 9.5

The conductivity fluctuates between 2010  $\mu\text{s}/\text{cm}$  at point 2 to 4290  $\mu\text{s}/\text{cm}$  at point 9. That corresponds to some respective mineralizations rates of 1,528 and 3,260 mg/l. Therefore, the water is salty brackish. The dominant anions and cations are the chlorides and cations.

The total germs rate or total flora is excessive. The total flora rate for temperatures with an incubation of 8° and 22° are respectively 10 and 100/ml. The presence of some faecal coliforms in samples 1, 2 and 3, and of some streptococcus in samplings 1 and 2 is abnormal, for apart total germs (TG) no germ must be present in the water.

### **SDE Pipe Water Analysis**

The PH is between 6.8 and 7.4. Therefore it is in conformity with the EEC standards. The conductivity is between 629  $\mu\text{s}/\text{cm}$  and 700  $\mu\text{s}/\text{cm}$  and is corresponding to the mineralizations rates of 471 and 532 mg/l, therefore inferior to the World Health Organization (WHO) standards and the French legislation, respectively fixed at 1,500 and 2,000 mg/l. For the conductivity the EEC standard is 400  $\mu\text{s}/\text{cm}$ . The dominant anions and cations are the chlorides and the sodiums.

### **Conclusion**

The underground water resources are precarious, polluted and insufficient. They cannot be subject to exploitation.

SDE production capacity is 14,000 m<sup>3</sup>/day of which 10,000 m<sup>3</sup>/day are exploited to this date. It has some 4,000 m<sup>3</sup>/day left over which can largely cover the needs of the project.

The SDE pipe in the project site is made of asbestos cement with a diameter of 350 mm. Pressure recordings carried out during 24 hours on the pipe have shown the maximal and minimal pressures of 3.4 and 1.8 bars. However, according to some information provided by some SDE officers in Saint-Louis, in peak period, the pressure in the 350 mm pipe can go down to 1 bar. For safety measures, the calculations have therefore been done based on that pressure.

The setting of a booster will allow to obtain an additional pressure of 2.5 bars corresponding to a water height of 25 m.

The site will also be equipped with a water softener. Besides the cleaning of the market and the washing of the fish will be done with sea water with a pump of 10 to 20 m<sup>3</sup>/h and a HMT of 10 m.



#### 4.1.4 Traffic Impact Survey

The vehicles according to their type and loading time

Vehicles	<15 min	15 ~ 30 min	30 min to 1hr	> 1hr	not specified	Total
Trucks	0	0	0	5	1	6
Refrigerated trucks	0	0	2	29	2	33
Pick-ups.	2	2	3	3	1	11
Vans	0	0	0	1	0	1
Taxis	3	2	0	0	0	5
Private vehicles	0	0	0	0	0	0
Total	5	4	5	38	4	56

There seems to be a great number of refrigerated trucks in Saint-Louis accounting for 48% during the period of our survey (May 27 to June 3, 1997). The vans rank after this at 21 %.

#### Origin and destination of fish transport vehicles Period May 30 to June 1, 1997

Towns/Villages	Origin	Destination	
		Number of vehicles	Quantity of fish marketed (tons)
Dakar.	8	17	61 (28%)
Saint-Louis.	32	9	54 (25%)
Louga.	5	7	23 (10%)
Richard Toll.	0	2	8 (4%)
Thies	2	0	0
Kayar.	0	0	0
Others	9	21	73 (33%)
TOTAL	56	56	219 (100%)

In Saint-Louis 57 % of vehicles originate from Saint-Louis, followed by those from Dakar and the other areas (14 %).

From Saint-Louis, destination to the others areas such as Ross Bethio, Dagana, Matam, Podor, Bakel etc. (38 %), followed by Dakar (30 %) and Saint-Louis (16 %).

**Distribution of the quantity of fish transported according to  
the types of vehicles  
Period : May 30 to June 3, 1997**

Type of vehicle	Saint-Louis	
	Quantity (tons)	%
Trucks	20	9
Refrigerated trucks.	106	48
Pick-ups	45	21
Vans	2	1
Taxis	1	0
Private vehicles	0	0
Horse carts	9	4
Others	36	17
<b>TOTAL</b>	<b>219</b>	<b>100</b>

**Average number of rotations  
per month and according to the type of vehicles**

Type of vehicles	Total number of vehicles	Total number of monthly rotations	Average number of monthly rotations
Trucks	6	81	14
Refrigerated trucks	33	611	19
Pickups	11	249	23
Vans	1	30	30
Taxis	5	120	24
Private vehicles	0	0	
<b>Total</b>	<b>56</b>		

**Distribution of the vehicle owners according to the number of vehicles**

Owners Number of vehicles	Saint-Louis	
	Number	%
Vehicle	45	80
2 or 3 vehicles	8	14
More than 3 vehicles	3	6
<b>TOTAL</b>	<b>56</b>	<b>100</b>

**Distribution of the vehicles according to vehicles ownership**

Drivers Status	Saint-Louis	
	Number	%
Owner	17	30
Non owner.	39	70
<b>TOTAL</b>	<b>56</b>	<b>100</b>

### **Traffic Pattern / Trend**

Limitation of a week's survey during lean period is not fully representative of the normal pattern. This was the case in Saint Louis when sardinella was in short supply during the period of the survey.

Traffic prediction is difficult in Senegal as traffic countings are very scarcely done and there is no annual census. Because of this, it is not possible to estimate seasonal coefficients nor a traffic growth rate based on past historical data.

The yearly pattern of traffic can however be predicted based on the yearly fish catch landing volume. As the fish catch volume is not expected to increase significantly in future due to the limitation of fisheries resources, the traffic volume due to fish transport / distribution is consequently not expected to increase significantly.

Nominal increase in traffic volume is however expected due to increase in population, number of cars in general, tourist numbers, etc.

### **Traffic Impact of Project**

The existing traffic pattern is expected to change due to the operation of new the fisheries complex. Whereas existing fisheries traffic is concentrated in Guet Ndar and Gokhoumathie, with the operation of the new complex, the fisheries traffic will be diverted to the complex.

This change in traffic pattern will free the congestion of the road in Guet Ndar and Gokhoumathie thus improving the living condition and safety of the community living beside the road.

The increase traffic along the road beside the river leading to the complex and within the complex itself will not have significant impact as the road and complex are designed to handle this traffic volume.

## **4.1.5 Social Impact Surveys**

### **Professional associations**

There are 8 associations in the Saint-Louis zone. Half of them are composed of GIEs. Most organizations have been created between 1990 and 1995. The oldest in the Federation of the Saint Louis Wholesalers. It was created in 1975. This vouches for the fact that all the actors of the fishery sector are familiar with functioning of collective organizations. Organizations have between 5 and 800 members.

#### **(1) Structuring of the organizations**

All of the organizations in the zone have a committee composed of 3 to 5 persons for GIEs and between 8 to 40 persons for associations and federations. It's the case of the federation of the fishermen's GIE in Saint Louis and the regional federation of the Saint Louis wholesalers whose committees respectively have 40 and 30 members.

Basically there are no committee re-elections. That's the case for many organizations whose committees have never been replaced since their creation. The rare re-elections that really took place were irregular. That's the case for the federation of the fishermen's GIEs in Saint Louis and the regional federation of the Saint Louis wholesalers.

For most organizations, the literacy rate does not exceed an average of 40 % (french, arabic and local languages taken into account).

#### **(2) Strategies of intervention and activities**

The strategy of intervention was hardly mentioned by the organizations. Those which did mention it, have rather condemned it. Moreover the strategy of intervention merges with the activities. It's the case of the GIE called Takky Liguéy for whom it would be convenient to give greater importance to processing activities.

The activities are relatively diversified. That's the reason why there are organizations of processors, sellers of fuel, fishermen and micro-wholesalers.

(3) Support or assistance

Local assistance is provided for all the organizations. In this way, almost all of the organizations have received credit from C.N.C.A. and technical assistance from fishery services.

As for foreign assistance, not many organizations receive it. However, one can notice the presence of:

- BK Conseil which backs up the micro wholesalers' organization in the field of training;
- One fishermen's association from Boulogne sur mer (France) in partnership with the regional branch in Saint Louis of the National Collective of Fishermen

It should be noted that the organization of gasoline sellers (Xeel ak Xalat) receives some technical assistance from Shell Company for the maintenance and the servicing of the gasoline pumps.

(4) Incentive for a possible frequenting of the centre

By and large, it should be said that the organizations do positively appreciate the setting up of the centre. This latter will help ease the difficulties the organizations are confronted with and will contribute to the development of the city of Saint Louis through the jobs that will be created.

However for the GIE Bokk Khol Takku Liguey, secondary centres should be adjoined to the centre for the centre will be located far from their working area (i.e the fishermen of Santhiaba and Coox Badj).

All the organizations acknowledged that the services that would be provided by the centre should not be free of charge.

### Ice sellers

As in Kayar site, ice sellers are not organized. They exercise their activities without a scope of dialogue. It should be noted that many ice sellers have an experience of more than ten years, and they are on average between 35 and 50 years old.

Ice selling is their only activity. Ice sellers exercise their business only in Saint Louis city which is also their place of residence. The tasks relative to the selling of ice are similar to those noted in Kayar.

(1) Appraisal of the ice-making plant in the centre

Ice sellers maintain that the setting up of the center would solve the problems related to supply. However, some problems still will remain unsolved; they may lose some of their clients who could directly turn to the center. That's the reason why the ice-making plant could be positive for them if only it were for wholesalers.

### Carpenters

Like the mechanics, carpenters are not affiliated to an organization. Many carpenters are not from the city of Saint Louis. They come from Rufisque and Mbour. However there are more and more some carpenters who are native of Saint Louis. They also have an experience of 15 to 40 years.

(1) Appraisal of the creation of the centre.

The appraisals are positive for the carpenters think that it will be profitable to all the trades.

## Mechanics

Mechanics lack organization too. As in Kayar they also have a professional experience of 8 to 15 years. They basically live within the commune of Saint Louis where they work.

(1) Appraisal of the creation of the centre.

The major problem mechanics have mentioned are related to the supply in spare parts and to the lack of tools which limits their efficiency. To solve the problems, they suggest the setting up of several stores selling spare parts and possibilities to have an access to credit for equipment.

Mechanics are favourable to the setting up of the center but they think that the proposed site is a little bit too far. Transportation should be facilitated. Repairing rates and remuneration must be studied carefully so as to avoid what caused the failure of the previous experience. In fact, the failure was due to the following:

- the mechanics were confronted with transportation problems when they wanted to go to the center;
- the charges for the repairing of an engine were too low;
- the mechanics that were hired lacked motivation for they were not well paid
- some mechanics were not qualified enough.

## Socio-Demographic Characteristics Of The Districts

The zone of the project is composed of 5 districts with population around 150,000 inhabitants. 70 % of this population is composed of wolofs, in this case the lebous.

At the second position we have the toucouleurs, then the moors, peulhs and bambaras. Emigration is relatively important in this zone of the project. It's only in the upper Ndar Toute that it's importance has been said significant.

The main part of the emigrants performs fishing activities. As for immigration, its impact is important only in 3 districts: Dack, Lodo and Gokhoumbathie.

The settlement of new comers takes place in good conditions since they are often sponsored by an influential notable from the district. The coming of the immigrants is mainly motivated by the fact that they can find job easily.

On average around 60 % of the children attend French schools and 90 % Arabic schools. On the other hand the average of the active people who can read and write french does not exceed 30 %, in the case of arabic, the average is around 20 % and those who can read and write local languages are around 15 %.

Presentation of the districts

Districts(1)	Number of inhabitants	Ethnical groups by order of importance	Activities performed by order of importance
DAK	More than 100,000	Lebou Toucouleur	Fishing, wholesaling, processing, trade, mechanics, carpentry
LODO	35,000	Moor Lebou Peulh Bambaras	Fishing, wholesaling, processing, mechanics, carpentry, ice sale
LOWER NDAR TOUTE	ND	Wolof Moor	Fishing, wholesaling, Trade, brick laying; carpentry, (woodwork) mechanics
UPPER NDAR TOUTE	6,500	Wolof Moor	Fishing, trade, Wholesaling Processing
GOKHOUMATHIE	ND	Toucouleur Wolof Moor Toucouleur	Fishing, trade, wholesaling, processing

ND/ Not declared

- (1) The district of Lodo and Dak are located in Guet Ndar, and are the two districts of this area.
- (2) The districts of lower Ndar Touted and upper Ndar Touted located in Santhiaba. Hydrobase does not appear here as a district which is the case in the analysis of the results of the household surveys. In fact Hydrobase has not been erected officially as a district; it depends on Dak which is a district of Guet Ndar.

Percentage of actives in connection with the activities performed.

Districts	Dak	Lodo	Lower Ndar Touted	Upper Ndar Touted	Gokhoum-bathie
Activities					
Fishing	100 %	90 %	80 %	80 %	60 %
Processing	80 %	ND	ND	ND	ND
Wholesaling	70 %	10 %	20 %	ND	ND
Trade	10 %	5 %	1 %	10 %	ND
Ice sale	5 %	ND	ND	ND	ND
Transportation	5 %	ND	1 %	ND	ND
Carpentry	5 %	10 %	1 %	ND	ND
Mechanics	5 %	10 %	ND	ND	ND
Catering	8 %	ND	ND	ND	ND
Micro-wholesaling	80 %	7 %	ND	50 %	90 %

(1) Source Chief of Quarters

Actives of the districts belonging to professional groupings

Districts	Type of activity	% of active members in the district	Type of association
DAK	Fishing	50 %	Community organization. Federation of the GIES of wholesalers GIE Dioko Liguey
	Wholesaling	100 %	
	Micro-wholesaling	50 %	
LODO	Fishing	100 %	Mutual associations Association Association
	Wholesaling	ND	
	Micro-wholesaling	ND	
LOWER NDAR TOUTE	Fishing	80 %	Fishermen's GIE GIE UNACOIS GES GIE
	Wholesaling	20 %	
	Trade	50 %	
	Ice sale	ND	
	Micro-wholesaling	10 %	
UPPER NDAR TOUTE	Fishing	80 %	Association ND ND ND Grouping together ND
	Trade	10 %	
	Carpentry (1 person)	ND	
	Mechanics (5 persons)	ND	
	Micro-wholesaling	50 %	
	Oil station services	1 station	
GOKHOUMBAT HIE	Fishing	50 %	GIE GIE ND Associations GIE
	Wholesaling	ND	
	Transportation	ND	
	Trade	70 %	
	Micro-wholesaling	90 %	

Around 50 % of the heads of household are present in the zone of the project all the year long. Only 1/6 of the heads of household are outside the zone of the project for more than 6 months. However, we can easily notice that in the whole around 40 % of the heads of household will be outside the zone of the project for at least one month.

Presence in the zone or elsewhere of the heads of households (Saint Louis)

Districts	Zone of the				Elsewhere			Activities performed
	12 months	1 to 6 months	More than 6 months	Main activities performed	12 months	1 to 6 months	More than 6 months	
Dak	49	25	23	- Fishing - Whole-saling - Trade	01	27	18	Fishing
Upper Ndar Toute	20	12	09	- Fishing	0	15	06	Fishing
Lower Ndar Toute	28	20	14	- Fishing - Whole-saling	01	22	22	Fishing
Hydrobase	09	09	01	- Fishing	0	03	08	Fishing
Lodo	35	38	20	- Fishing	02	30	28	Fishing
Gokhoumbathie	37	08	13	- Fishing	0	14	07	Fishing
<b>TOTAL GENERAL</b>	<b>178</b>	<b>105</b>	<b>62</b>		<b>04</b>	<b>111</b>	<b>62</b>	<b>Fishing</b>

As for the consorts of the heads of household they are almost all present in the zone of the project all the year long (see following table). They perform during this period micro-wholesaling, fish processing and trade. The consorts of the heads of household who stay outside the zone of the project are often those who accompany their husband during the campaign. They are in charge of the preparation of the meal, and during this trip they devote to micro-wholesaling, and processed fish marketing.

Presence in the zone or elsewhere of the consorts of the heads of household

Districts	Zone of the				Elsewhere			
	12 months	1 to 6 months	More than 6 months	Main activities performed	12 months	1 to 6 months	More than 6 months	Activities performed
Upper Ndar Toute	46	0	02	Trade Micro-wholesaling	0	02	0	Trade, Micro-wholesaling
Hydrobase	22	0	0	Micro-wholesaling	0	0	0	Micro-wholesaling
Lodo	110	0	03	Processsing Micro-wholesaling	0	03	0	Micro-wholesaling
Gokhoumbathie	59	0	07	Micro-wholesaling trade	0	07	0	Micro-wholesaling trade
Lower Ndar Toute	65	0	06	Micro-wholesaling	0	09	0	Micro-wholesaling
Dack	99	02	01	Trade, micro-wholesaling, Processing	0	27	0	Trade
<b>TOTAL GENERAL</b>	<b>401</b>	<b>02</b>	<b>25</b>		<b>0</b>	<b>27</b>	<b>0</b>	



## 4.2 Project Site in Kayar

The proposed site at Kayar encompasses the DOPM's office, an ice plant, local retail market and some houses. It is located west of the main road leading into Kayar and at the beginning of the village.

### 4.2.1 Soil Investigation

#### Dynamic penetration test

From the analysis of the penetrometer diagrams, we observed the following:

- At the vertical of PD<sub>3</sub>, PD<sub>7A</sub>, PD<sub>7B</sub> and PD<sub>8</sub> the resistances are relatively low and remain most of the time inferior to 2MPa. This might be due to the fact that the dynamic penetration tests were done on a natural ground mainly sandy and soft on the shallow stratum.
- From 2 m, down to the depth the resistances are in the whole very high. The maximum resistances remain higher than 10 MPa. Anyway we have to point out the presence of less resistant spots which are inserted in the most resistant stratas at some 4 and 6 m deep in PD<sub>1A</sub>, 4 and 8 m in PD<sub>1B</sub> at 4 m in PD<sub>2</sub> and at 3 and 6 m in PD<sub>5</sub>.
- The increase of the resistances in the depth were noticed through localized resistances (hard) between 6 and 8.40 m. (The rod couldn't drive in those points).

#### N Values

The boring sections showed from the surface 20 m of sands sometimes interrupted by gravelly and lateritic or shelly spots.

- 4 < N < 10 = little compact sand
- 10 < N < 30 = moderately compact sand
- 30 < N < 50 = compact sand
- N < 50 = very compact sand.

The standard penetration tests gave N values, generally comprised between 11 and 50 for Sc1 boring and between 5 and 30 for Sc2 boring. This shows the presence of little to moderately compact sands, that are sometimes compact.

#### Laboratory Tests

##### (1) Specific gravity

The rates vary between 1.36 and 1.58 T/m<sup>3</sup> and testify of a compactness relatively quite satisfactory on the whole.

##### (2) Water content

The rates are relatively low and remain comprised between 2.0 and 12.5 %.

##### (3) Sand equivalent (SE)

The sands discovered in the sampling bore holes and the hand - made well present an Es piston comprised between 41 and 90 % which proves that we are in the presence of quite clean sands.

##### (4) Grain Size Distribution

The soils are made of medium to fine sands, which size are generally comprised between 0.1 and 0.5 mm and can hold some shelly or lateritic gravelly elements.

### Mechanical characteristics

#### (1) Shear tests

Some shear tests were made on the sand from 0.00 down to 3.00 m and show an average angles of repose of 33° and an average adhesion of 0.07.

#### (2) Compressibility

Considering the lithology of the soils (sands) and the first results from the oedometric tests (on going) the compressibility can be assessed very low.

### Conclusion

All the penetrometric curves allow us to establish an admissible load varying between 0.2 Mpa and 0.3 Mpa. Their resistance to dynamic penetration and their capacity make it possible to lay the foundations of the heavier facilities at 2.00 m and at 1.50 m for those of lighter structures.

It is also convenient to precise that given the proximity of marine waters, it is recommended to use CHF<sup>2</sup> cement so as to protect the foundation against the effect of those marine waters. Furthermore, the level of the phreatic varies between 2 and 3.5 m down in project site ground.

#### **4.2.2 Topographic Survey**

The average height of the area around the Ice Plant is about 3.9 m and around DOPM office about 3.3 m. About 40 households, the local retail market, CAEP and DOPM office will be effected by the initial phase of the project. The existing Ice Plant and CNCA office will not be effected.

#### **4.2.3 Water Survey**

##### Boreholes in Kayar Village

All the wells visited are operating (functional) and they harness the Quaternary sands. The depth varies from 3.68 to 1.79 m/soil. These watering points do not dry up under the effects of drawing.

Water heights are weak and we noticed in almost all the works visited, a garbage dump at the bottom of the wells, solid matters in suspension. Works are traditional type, all the wells are cemented.

In this interval, the highest conductivity rate was recorded at P6 (in the mosque) with 3,260 µs/cm, corresponding to a mineralization of 2,478 mg/l, it is higher than the standards. The lowest conductivity rate is seen in point 3 (post office) with 714 µs/cm, that's to say 543 mg/l. This could be explained by its distance from the ocean.

The dominant anions and cations of point 2 (bakery in front of DOPM office) and 5 (opposite post office along main road) are chlorides and sodium.

However in point 1 (entrance of Kayar) the main anions and cations are sulfates, calcium, and chloride type, whereas in point 6 it is chloride calcium type. P6 being an open well in the yard of the mosque, at some 50 m from the ocean. It is very often chlorinated. This high rate of chloride can be explained by the concentration of chloride coming from the bleach which is used to chlorinate the well.

The observation of the results of the microbiological analysis shows that the total germs or flora content is higher than EEC's standards (10/ml and 100/ml respectively for incubation temperature of 8°C and 22°C). For all other germs except for the total flora we have an absence. However we notice the presence of faecal coliforms in an excessive quantity due to human action.

##### Borehole at Kayar Ice Plant

P8 correspond to the sample taken in DOPM bore hole, the one harnessing the Quaternary sands between 14.55 and 24.70 m deep. The prospection depth is 28 m. This

very unstable aquifer is under the risk of salt intrusion The flow can't exceed 50 m<sup>3</sup>/h for a limited pumping time.

The conductivity is 3,510 µs/cm, that's to say 2,671 mg/l of mineral content, which is higher than the potability standards fixed at 1,500 mg/l by WHO and 2,000 mg/l by French regulation, EEC conductivity standards for drinking water are 400 µs/cm, therefore the water in this bore hole has a conductivity rate by far higher than the standards.

The chloride content is 284 mg/l, the standards are 25 mg/l and the maximal content admitted is 200 mg/l. Its sulphate content is 215.7 mg/l, whereas the standards say 25 mg/l at most and the maximal content is 250 mg/l. The dominant anions are chloride and the dominant cations are sodium.

### Conclusion

The layer of Quaternary sands possesses precarious resources. The water is charged and the rate of bacteria is high. The exploitation of this water expanse is not advisable.

The only underground resource available in sufficient quantity and good quality is that provided by the water expanse of the paleocene limestones located about 3.5 km to the south east of Kayar near the village of Tieudèm. The exploitation of this water expanse will be done with a bore hole of 200 m investigation depth.

The execution of a bore hole in Kayar is not advisable, because the village is located close to the ocean and the limestones fissures could be a source of pollution.

#### 4.2.4 Traffic Impact Survey

The vehicles according to their type and loading time (Kayar)

Vehicles	<15 min	15 - 30 min	30 min to 1hr	> 1hr	not specified	Total
Trucks	3	1	2	5	0	11
Refrigerated trucks	0	6	16	39	1	62
Pick-ups	3	6	28	36	2	75
Vans	0	2	1	5	0	8
Taxis	14	10	23	6	2	55
Private vehicles	5	3	4	4	0	16
<b>Total</b>	<b>25</b>	<b>28</b>	<b>74</b>	<b>95</b>	<b>5</b>	<b>227</b>

#### Origin and destination of fish transport vehicles Period May 30 to June 3, 1997 (Site : Kayar)

Towns/Villages	Origin	Destination	
		Number of vehicles	Quantity of fish marketed (tons)
Dakar	97	151	225 (56%)
Saint-Louis	2	1	0
Louga	0	0	0
Richard Toll	0	1	0
Thies	50	43	66 (16%)
Kayar	49	22	108 (27%)
Others	29	9	3 (1%)
<b>TOTAL</b>	<b>227</b>	<b>227</b>	<b>402 (100%)</b>

**Distribution of the quantity of fish transported according to  
the types of vehicles  
Period : May 30 to June 3, 1997**

Type of vehicle	KAYAR	
	Quantity(in tones)	%
Trucks	35	9
Refrigerated trucks.	114	28
Pick-ups	56	14
Vans	5	1
Taxis	67	17
Private vehicles	36	9
Horse carts	55	14
Others	34	8
<b>TOTAL</b>	<b>402</b>	<b>100</b>

**Average number of rotations  
per month and according to the type of vehicles**

Type of vehicles	Total number of vehicles	Total number of monthly rotations	Average number of monthly rotations
Trucks	11	243	22
Refrigerated trucks	62	1531	25
Pickups	75	1737	23
Vans	8	160	20
Taxis	55	1228	22
Private vehicles	16	346	22
<b>Total</b>	<b>227</b>		

**Distribution of the vehicle owners according to the number of vehicles**

Owners Number of vehicles	Kayar	
	Number	%
Vehicle	179	79
2 or 3 vehicles	43	19
More than 3 vehicles	5	2
<b>TOTAL</b>	<b>229</b>	<b>100</b>

**Distribution of the vehicles according to vehicles ownership**

Drivers Status	Kayar	
	Number	%
Owner	107	47
Non owner.	120	53
<b>TOTAL</b>	<b>227</b>	<b>100</b>

### Traffic Pattern / Trend

Limitation of a week's survey during lean period is not fully representative of the normal pattern. Traffic prediction is difficult in Senegal as traffic countings are very scarcely done and there is no annual census. Because of this, it is not possible to estimate seasonal coefficients nor a traffic growth rate based on past historical data.

The yearly pattern of traffic can however be predicted based on the yearly fish catch landing volume. As the fish catch volume is not expected to increase significantly in future due to the limitation of fisheries resources, the traffic volume due to fish transport / distribution is consequently not expected to increase significantly.

Nominal increase in traffic volume is however expected due to increase in population, number of cars in general, retail market activities, tourist numbers, etc.

### Traffic Impact of Project

With the operation of the new fisheries complex, fish marketing / distribution pattern will remain relatively unchanged from existing fisheries traffic pattern. From the traffic survey, most of the fisheries traffic are concentrated at the ice plant area with only about 1/5 at the other landing points in Kayar.

Improvement in traffic flow may be expected with the relocation of the local retail market to a newly designed location with proper traffic flow control. Also the traffic within the complex will be more orderly as parking berth will be provided. More efficient loading / unloading system in the new complex will mean a faster traffic turn around with less waiting time resulting in less congestion.

## 4.2.5 Social Impact Surveys

### The professional organizations

We find in Kayar eight (8) professional organizations which are almost all formed into GIE, except the departmental federation of wholesalers and the villagers development committee, which are associations.

It is suitable to notify that the departmental federation of wholesalers is composed of 16 organizations which are almost all erected into GIEs.

The Mantoulaye GUENE Gie is the senior one. In fact, it has been created in 1985. That is to say that, the professionals in the Kayar zone have gathered a significant experience in the field of the management of the organizations.

Besides, nearly all the structures have more than 5 years experience.

The number of members varies between 120 and 675. There are some of them with less than 20 members. Moreover, there organizations (there are 3 of them) are very often family GIEs.

#### (1) Decision making instances

All the organizations are strongly structured. They have bureaus, which composition varies between 4 and 9 members. As for the former case, most of the organizations whose bureaus are composed of less than 4 members are family GIEs.

As for the renewal of the bureau, it has been mentioned that it was not done regularly (it's the case of GIE Foula ak fayda).

#### (2) The financial management

Most of the time, the financial management of these structures is well carried out. There is a good handling of accounting records except for the organizations of U.N.A.P.E.S., Foula ak Fayda and the Departmental Federation of Wholesalers. We feel here the need to support all these associations for a better training in management.

(3) The strategies of intervention and the activities

Most of the time, the potential beneficiaries confuse the strategies and the activities. That's why the activities are largely evoked. They are about fishing, wholesaling, processing and marketing. But fishing remains the most important.

(4) Support or assistance to organisations

Most of the GIEs don't benefit from any assistance, be it local or foreign, except the village development committee which is supported by reseau 2000.

(5) Incentive for a frequenting the centre

It's necessary to understand that the points of view of the organizations were enough to determine the degree of acceptance of the project. In fact these professional organizations constitute a main piece in the development of the fishery channel (sector). The whole organizations think that the project is good for the development of their activities and those carried out in Kayar zone.

Despite the fact that the use of some of the services and facilities entail a charge, the professional associations were of the opinion that they wish to use these services / facilities offered by the new complex.

(6) Appraisal regarding the relocation

All the organizations think that this relocation is absolutely normal. However it would be convenient to compensate the people who will be concerned on one hand, and on the other hand to allot them new plots of land if it has not been done yet. To them, it belongs to the State to order this relocation. In fact, populations might not decide to remove by themselves even though they have been compensated and allotted new plots of land.

This statement is all the more effective that we have been indicated that, most of the heads of family living in the site where the project is to be implemented have already been allotted plots of land after the bloody events which took place in 1987.

### Ice sellers

Contrary to actors evolving directly in the fishery sector (as mentioned above), ice sellers are not organized properly speaking. They are not grouped to ensure the defense of their interests, and look in an organized way for better conditions for the performance of their activities.

Ice sale constitutes a real professional activity allowing its actors to ensure the follow up. In fact we notice that ice retailers are responsible of families and their age is comprised between 35 years and 50 years maximum. Ice sale is the only activity they carry out.

Most of ice sellers have started performing their activities more than fifteen (15) years ago. Ice sale is their only source of income. Ice sale is rather an individual or almost a family enterprise. Often, the ice seller is helped by a close relative whom he pays off from time to time, however he considers this person ensuring the support as an employer. Works relative to the performance of their activity are relatively simple: it is mainly about finding a means of transportation, ensuring a regular supply and marketing the product quickly.

(1) Appraisal of the ice-making plant in the centre

The implementation in Kayar of this ice plant would solve the difficulties due to transportation and shortage of ice in Kayar. However, some reserves have been expressed by the ice sellers who think that, in fact the ice plant might bring some advantages to them only if some conditions are met:

- the production must be of sufficient quality and quantity;
- ice sale should be done only by wholesale dealers;
- the prices must be favourable compared to those applied by traders.

### Carpenters

Like the ice sellers, these carpenters are not organized into organizations to ensure the defense of their interests. The performance of these activities is effected individually in the families.

This activity which consists in building traditional boats constitutes the only source of income of carpenters. Carpenters' age is comprised between 30 years and 50 years maximum, that is to say that they are all married and responsible of numerous families. Nearly all carpenters have more than 15 years of professional activity and live all in the project site.

#### (1) Appraisal of the creation of the centre.

They think that the implementation of the centre is a good thing and might allow them to develop their activity in the sense that it will increase the means of production of wholesalers, fishermen and processors.

### Mechanics

They are the ones in charge of the reparation of outboard engines. Similar to the carpenters and ice sellers, they are not organized into organizations for the defense of their interests. On the other hand we find among them some wage earners, a particular group. In fact, in this area in Kayar, there are some mechanics who are recruited by a garage owner, and it belongs to this latter to discuss the remuneration of the service provided with the client. When the price is fixed it is divided into equal shares between the mechanic and the garage owner. We find also independent mechanics who manage their own workshop.

#### (1) Appraisal of the creation of the centre.

The mechanics think that some shops for spare parts must be set in Kayar area but also workshops with the security standards must be provided.

In the all, this trade association thinks that the implementation of the centre might offer some advantages, provided that it can have the possibility to perform effectively its activity in the centre.

### Head Of The Village

The head of the village judges that in the whole, almost all the population, himself included, is favourable to the implementation of the center provided that it could ensure the development of the zone and favour the creation of new jobs. According to him these (elements) are the expectations of the population as far as the project is concerned.

#### (1) Appraisal of the relocation

The head of the village insists on the fact that the issue of the relocation has been raised ten years ago, that is to say that the population is aware of about the execution of such a decision. However, he considers that two accompanying measures must support this relocation.

These measures are:

- 1 - to compensate the population to that will be relocate;
- 2 - to allot them new plots of land in another site.

### Socio-demography of Households

#### (1) Demographic condition

It's a village populated with 12,000 inhabitants composed according to the order of importance as follows: wolofs, peulhs, sereres; diolas and soces. The population of

this village practices muslim religion. Emigration, that is to say rural exodus is practically non-existent. This is an uncommon fact compared to other villages in Senegal. The situation demonstrates the intensity of the economic life prevailing in this village. As a matter of fact immigration is very important because of the fact that job can be found very quickly.

Among the 86 squares surveyed, we found of course, 86 heads of square or heads of family and 189 heads of household divided as follows:

- 40 heads of family live in the project implementation site;
- 46 heads of family live out of the project implementation site;
- as for the heads of household, 88 live in the project implementation site and 101 out of it.

At the level of the heads of family, almost all the heads of family are married. Only two of them have got divorced. Half of the heads of family are polygamists, 80 % of them have two (2) or three (3) wives and the others have more than 3 wives. Nearly half of them are more than 56 years old as indicated by the following table:

Distribution of the heads of family by age group and by site (KAYAR)

	40 years	41 to 55 years	56 years and more
In the site	6	18	16
Outside of the site	5	15	26
TOTAL	11	33	42

We notice also that 45 % of the heads of family are natives of Kayar. However almost all the heads of family born out of Kayar live in the project implementation site.

Distribution of the heads of family by place of birth and site (KAYAR)

	Kayar	Elsewhere
In the site	1	39
Outside of the site	39	7
TOTAL	40	46

The heads of family who are not natives of Kayar have been living in this village for more than 20 years. The own family of the heads of family is composed on average of 8 persons among whom 4 actives ones.

At the level of the heads of household: We find on average 2 households per square, nine (9) persons per household among whom 4 active ones in the all.

(2) The economic activities

Fishing constitutes the main activity of the villagers. Fishermen are often GUET-NDARIANS who have settled in the village 30 years ago. They constitute mainly the population living in the area where the future centre is to be built.

The other activities revolve always «around fishing». They are by order of importance wholesaling, fish processing, marketing, mechanical reparations (outboard engines) and ice sale.

Around 70 % of the heads of household are present in the village all the year long. The main activity they carry out during this period is fishing, followed slightly by



wholesaling and farming. Even the 27 % of them who are present in the village only for 1 to 6 months carry out fishing activities during their absence.

Presence in the zone or elsewhere of the heads of household along the year

Kayar area			Main activities carried out	Elsewhere			Main activities carried out
12 months	From 1 to 6 months	More than 6 months		12 months	From 1 to 6 months	More than 6 months	
111	10	43	Fishing farming whole-saling	2	47	2	Fishing

As for the consorts of heads of household, almost all of them are present in the zone all the year long. However nearly half of them are not carrying out any activity. These who do it devote themselves to micro-wholesaling and trade.

Presence in the zone or elsewhere of the consorts along the year

Kayar area			Main activities carried out	Elsewhere			Main activities carried out
12 months	From 1 to 6 months	More than 6 months		12 months	From 1 to 6 months	More than 6 months	
156	5	22	Micro-wholesaling, trade	1	24	1	None (1)

(1) These consorts haven't yet joined their husbands' marital home.

(3) Socio-economic organization of family life

The social organization of the family, in this case the lebous from Kayar, is characterized by the pre-eminence of the head of family or the head of square.

That's the way at the level of the squares where we find several heads of households, meals are prepared at the head of the family's place, under the direction of the consorts or several consorts of the head of the family. This cooking can be done by turn by the wives of the head of household or in group by the consorts of all the heads of household.

The management of the daily expenditure is supervised by the head of the family or the head of the square. However, in most of the cases, it's the head of the household who provides the daily expenditure.

More than half of the heads of household manage by their own their incomes. However, the management of the incomes of the heads of household by the heads of family still prevails in 40 % of the households.

We have also noticed an important fact which denotes progressively the economic autonomy of women.

That's the way that almost all women generating incomes manage them by their own.

(4) Incomes of the heads of square or of family

As for heads of family who are fishermen, almost all of them have yearly incomes comprised between 300,000 CFAF and 500,000 CFAF. Only 10 % of them have yearly incomes comprised between 500,000 CFAF and 1,500,000 CFAF.

Women processors (fish) are not numerous (3 % of active women). Those who perform this activity have yearly incomes between 300,000 CFAF and 500,000 CFAF.

As for wholesalers, around 80 % have incomes between 300,000 and 500,000 CFAF.

Traders happen to make yearly incomes around 500,000 CFAF. It's the same as for restaurant owners.

It's necessary to point out that the net incomes of the heads of family of these different professional categories have not been well apprehended because almost all those interviewed have not been able to answer these different question conveniently.

(5) Incentive of the heads of household for frequenting the center

As it had been mentioned in the professional sectors surveys, the heads of family, be they live in the implementation site or not, are favourable to the creation of this center. Apart from the various advantages which have been evoked to support the creation of this center (see professional sectors surveys) almost all the heads of family (83/86) think that the conditions of performance of the activities in the project implementation site are not satisfactory at all because of (by order of importance):

- we notice a notorious insalubrity;
- we notice an insufficiency of equipments;
- the existing site is narrow.

According to the heads of family, the requirements the center should fulfill to meet the services they need are by order of importance:

- 1 - the insurance of competitive prices (40 %)
- 2 - a good quality service (38 %)
- 3 - a good organization of the services provided by the center (10 %)
- 4 - an efficient service to allow them to have access to credit (3 %)
- 5 - around 4 % did not give their opinions

(6) Appraisal of the relocation

42 % of the heads of family, that is say 17 of them agree that their houses located in the project implementation site is not their only residential area. However they are the only area they have for the performance of their professional activities for the heads of family who use them for marketing purposes.

In the whole, among the 40 heads of family or square concerned, that is to say nearly all of them accept the principle of the relocation and the reason is that they occupied this area irregularly as it is located in the state maritime property, even though most of them (35/40) have been living there for years..

The 3 heads of family who refused the principle explain that it's because they don't have means to relocate themselves, due to the possible distance of their residential area compared to the actual site of performance of their professional activities.

The 37 heads of family who have accepted the principle of the relocation are ready to settle elsewhere if the state provides help:

- 1° - for the allotment of a plot of land not far from the future center;
- 2° - for benefiting from a symbolical allowance but which can help them rebuild their house.