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MINISTERE DE L' HABITAT, DE LA  
CONSTRUCTION ET DE L' HYDRAULIQUE  
DIRECTION DE L' HYDRAULIQUE RURALE

STUDY  
ON  
RURAL WATER SUPPLY  
IN TAMBACOUNDA AND MATAM REGIONS  
IN REPUBLIC OF SENEGAL

FINAL REPORT  
SUMMARY

MARCH 2011

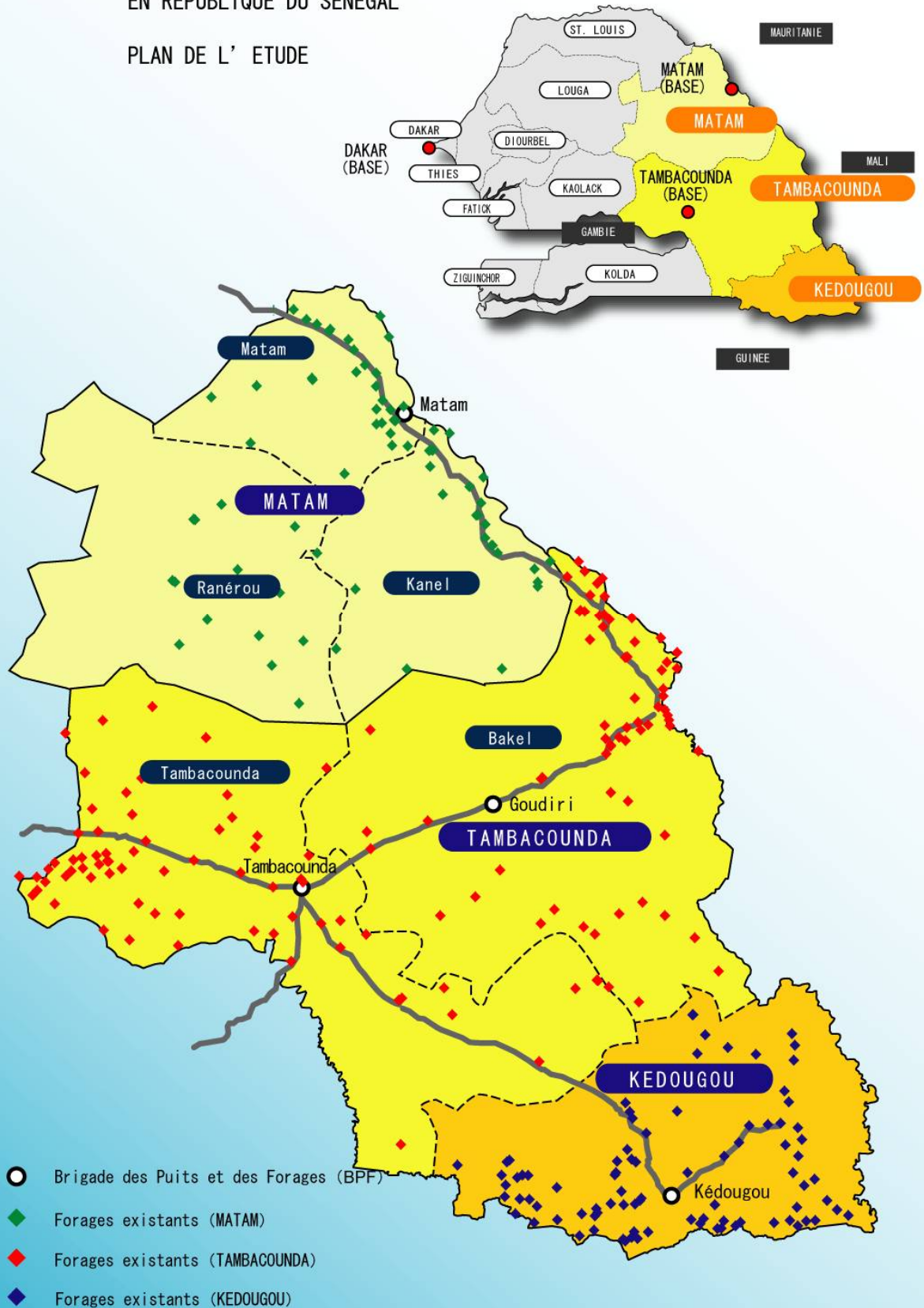
JAPAN INTERNATIONAL COOPERATION AGENCY

JAPAN TECHNO CO.,LTD.  
KOKUSAI KOGYO CO.,LTD.



ETUDE SUR L' HYDRAULIQUE RURALE  
DANS LES REGIONS DE TAMBACOUNDA ET MATAM  
EN REPUBLIQUE DU SENEGAL

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## ABBREVIATIONS

Abbreviation	Name
AEI	Analyse Environnementale Initiale
AEMV	Adduction Eau Multi Villageoise
AEV	Adduction Eau Villageoise
ADDEL	Appui à la Décentralisation et au Développement Local
ARD	Agence Regionale Development
ASUFOR	Association des Usagers de Forages
AFD	Agence Française de Développement
BAD	Banque Africaine de Développement
BADEA	Banque Arabe pour le Développement Economique en Afrique
B/D	Base de Données
BID	Banque Islamique de Développement
BPF	Brigade des Puits et des Forages
CADL	Centre d'Appui au Développement
CR	Communauté Rurale
CTB	Coopération Technique Belge
DAR	Direction de l'Assainissement Rural
DEEC	Direction de l'Environnement et des Etablissements Classés
DS	Direction de la Santé
DEM	Direction de l'Exploitation et de la Maintenance
DGPPE	Direction de la Gestion et de la Planification des Ressources en Eau
DHR	Direction de l'Hydraulique Rurale
EES	Evaluation Environnementales Stratégiques
EIE	Etude d'Impact sur l'Environnement
EIA	Etude d'Impact Approfondie
EU	Union Européen
FCFA	Franc de la Communauté Financière Africaine
FED	Fonds Européen de Développement
FMH	Forage équipé d'une Pompe à Motrice Humaine
F/S	Feasibility Study
FSD	Fonds Saoudien de Développement
GRDR	Groupeement de Recherche pour le Développement Rural
JICA	Agence Japonaise de Coopération Internationale
JOCV	Japan Overseas Cooperation Volunteers
KOICA	Agence Coréenne de Coopération Internationale
KfW	Kreditanstalt für Wiederaufbau
MDGs	Millennium Development Goals

Abbreviation	Name
MFT	Marteau fond au trou
NGO	Non-Governmental Organizations
OJT	On-the-Job Training
MDGs	Millennium Development Goals
NGO	Non-Governmental Organizations
PACEPAS	Programme Appui Commune rural Eau Potable Access et Assainissement et Sanitation
PADV	Projet d'Appui au Développement Villageois
PAGIRE	Plan d'Action de Gestion Intégrée des Ressources en Eau
PARPEBA	Projet d'Amélioration et de Renforcement des Points d'Eau dans le Bassin Arachidier
P/D (M/P)	Plan Directeur
PEPAM	Programme d'Eau Potable et d'Assainissement du Millénaire
PEPTAC 2	Projet Eau Potable pour Tous et Appui aux Activités Communautaires 2
PHAST	Participatory Hygiene and Sanitation Transformation
PLD	Plan Local de Développement
PLHA	Plan Local Hydraulique et Assainissement
PNDL	Programme National de Développement Local
PNIR	Programme National d'Infrastructures Rurales
PRDI	Plan Régional de Développement Intégrée
PRS2	Programme Régional Solaire 2
PVC	Polyvinyl Chloride
SAED	Société Nationale d'Aménagement et d'Exploitation des Terres du Delta du Fleuve Sénégal et des Vallées du Fleuve Sénégal et de la Falémé
SIG (GIS)	Systeme Information Geography
SNH	Service National d'Hygiène
SDE	Sénégalaise des Eaux
SM	Subdivision de Maintenance
SONES	Société National des Eaux du Sénégal
UBT	Unités de Bétail Tropical
UEMOA	Union Economique et Monétaire Ouest Africaine
UNICEF	Organisation des Nations Unies pour l'Enfance
WHO	World Health Organization
WSP	Water and Sanitation Program



## UNITS

Abréviation	Nom
h (hr)	Hour
mm	Millimeter
m	Meter
km	Kilometer
mH	Meter Height
Km <sup>2</sup>	Square Kilometer
m <sup>3</sup>	Cubic Meter
L	Liter
KVA	Kilo Volt-Ampere
Mpa	Mega Pascal
N/mm <sup>2</sup>	Newton par Square Millimeter

## EXCHANGE RATE

1 EURO = ¥126,6

1 FCFA = ¥0,193

1 EURO = 655,957 FCFA (Fixed Rate)

## **Chapter 1 Introduction**

### **1.1 Outline of the Study**

#### **1.1.1 Background of the Study**

In Senegal, securing drinking water in rural areas has been a nationwide issue. The Senegalese government formulated a high rank program concerning water supply and sanitation whose name is PEPAM (Programme Eau Potable et Assainissement du Millenaire) in 2005 and has been promoting water supply and sanitation administration based on its policy. PEPAM aims to improve water supply rate from 64% to 82% (in 2015) and rate of access to sanitary service from 26,2% to 63% (in 2015) in rural areas with cooperation of residents, administration, private sectors, donors and other concerns.

The study target area consists of three regions, Tambacounda, Kedougou and Matam in Eastern Senegal. Compared with other areas, water supply facilities are not developed well. While the national average rate for access to safe water is 64% (in 2005), there remains about 30% in Tambacounda region and improvement of water supply is strongly desired. In Tambacounda and its surroundings, people are suffering from serious poverty and have severe conditions not only in water supply but also in education and sanitation fields. As a result of that, the development indices of the fields are significantly below the national average.

Tambacounda and Kedougou are located in relatively hard basement rock areas. Since it is difficult to secure a stable amount of water, water supply facilities are less developed than other areas. Though the Senegalese government is promoting to collect data on hydrogeological features and systematically develop water resources, sufficient results are not obtained yet. In order to promote the development of water supply facilities in this area, it is necessary to review projects based on the hydrogeological survey and to give technical support to improve the current water supply situation.

Japan has recognized rural water supply as one of the most important issues in Senegal and has cooperated since 1979. So far, Japan has constructed 115 water supply facilities through grant aid in Senegal. However, the number of sites implemented at the survey target area, which size is equivalent to 40% of this country, remains only 26 (23%) out of 115.

These 26 sites were selected by taking into consideration mainly the hydrogeological features or accessibility of construction machinery, and not necessarily based on the needs of water or results of development survey. Therefore, regarding PEPAM as a higher rank plan, the current conditions in water supply and sanitation facilities will be identified. After that, a plan, which contributes to more effective and efficient water supply and improvement of the sanitary situation in the target area, will be developed and implementation of the project will be promoted.

#### **1.1.2 Objective of the Study**

- (1) To formulate a master plan related to water supply and sanitation in the three regions of Tambacounda, Kedougou and Matam to contribute to access to safe water and an improvement in the current sanitary situation.
- (2) To conduct a feasibility study for the sites which are highly prioritized in the master plan.

#### **1.1.3 Study Area**

The study area covers Tambacounda, Kedougou and Matam Regions with an area of 84,685km<sup>2</sup> and population of 1.3million (Source : APSD Agence Nationale de la Statistique et de la Demographie, 2009). When the study started, the area consisted of Tambacounda and Matam only. However, since Kedougou was promoted to a region from a department in Tambacounda, the number of target regions for the study became three.

#### 1.1.4 Contents and Schedule of the Study

The study is divided into three stages: 1) Field survey, 2) Formulation of a master plan and 3) Feasibility study. Contents of each stage are as follows.

1) Phase 1-1 Field survey 1 : Survey concerning with rural water supply and sanitation

Collection and analysis of existing data were conducted, and the features and issues in the area were identified. Following surveys were implemented.

- Collection and analyses of existing information (law, administrative organization, policy, design manuals, well management register, etc.)
- Survey for the present condition of existing water supply facilities
- Survey for contamination at shallow wells
- Survey for social condition targeting village community (to understand the general aspect of villages, current situations of water usage and water supply)

2) Phase 1-2 Field survey 2 : Water resources Survey

Following surveys were implemented in the target area as water resources survey.

- Collection and analyses of existing information related to natural condition (hydrogeology, water quality, hydrometeorology, etc.)
- Site reconnaissance
- Geophysical prospecting
- Test drillings and analyses
- Survey for river flow rates
- Observation of groundwater level fluctuations
- Identification of current issues

3) Phase 2-1 : Formulation of a master plan 1 : Establishment of Basic Policy

The following items were reviewed based on the results of the field survey,

a) The basic policy of the master plan, b) Plan for water supply and its facilities, c) Structure of maintenance for the facilities. Specifications of facilities, measures for maintenance and privatization of management and maintenance of the facilities were also examined.

4) Phase 2-2 : Formulation of a master plan 2 : Determination of the project sites

The list which covers all villages in the target area was prepared. Some sites were selected to construct new water supply facilities and priority orders were given to them. Besides, the sites which require repair work for wells or facilities were identified.

5) Phase 2-3 : Evaluation for water resource potential

In order to evaluate water resource potential, the following items were reviewed.

- Estimation of the amount of groundwater recharge and groundwater pumping.
- Establishment of a simulation model and prediction of water resource potential by the model

6) Phase 3 : Feasibility study (F/S)

The current situation and state of poverty in the project sites were confirmed by social condition survey and 13 sites were selected. Then, Planning of Water supply and outline design was conducted from results of the site reconnaissance and survey for those sites. Based on the design, construction cost was estimated and also investment effect and economical evaluation was confirmed. With all of these evaluations, validity of the project was identified.

## **1.2 Composition of the Report**

The Main report is divided into three parts, First part : Outline of the study and current situation of the target area; Second part : Master Plan; and Third part : Feasibility Study. In the first part, current situation such as natural conditions, socio-economic situation and state of water supply in the target area was described. In the second part, project target and detailed measures, which are basic policies of the master plan, are described based on the results of the field survey. In addition, the specification of the facilities, the results of the examination on maintenance and privatization were summarized in this part. The results of the feasibility study, which aims for villages suffering from severe poverty, were summarized in the third part. Water supply plan and water supply facilities plan in the high priority sites were reviewed and cost of the construction was estimated. These plans were evaluated and their feasibilities were examined.

The Final report for this study is composed of Main report, Summary report, Supporting book and Data book. The Supporting book contains the measures and process of survey which are not described in the Main Report. Data book keeps the data which were collected and measured during the survey. Summary Report describes the essential parts and recommendations.

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## Chapter 2 Current Conditions of Senegal and the Target Area

### 2.1 Outline of Water Sector

#### 2.1.1 Administrative Organization

(1) Structure of the organization

As of November 2010, the Ministry of Housing, Construction and Water Supply (MHCH : Ministère de l'Habitat, de la Construction et de l'Hydraulique) is taking charge of the water sector. Concerning survey of the sector, the Department of Rural Water Supply (DHR : Direction de l'Hydraulique Rurale) is the main implementing agency. The Department of Management and Planning for Water Resources (DGPRE : Direction de la Gestion et de la Planification des Ressources en Eau) and Department of Development and Maintenance (DEM : Direction de l'Exploitation et de la Maintenance) are also involved in surveys in the sector.

(2) Outline of the activities implemented by above-mentioned organizations

1) Department of Rural Water Supply (DHR) : DHR has identified the current situation of water supply and formulated guidelines concerning rural water supply. In order to construct facilities, surveys have been conducted and then actual constructions of water supply facilities and construction management have been promoted under the supervision of DHR. While supporting companies and local government related to rural water supply, it has given support to rural water supply projects implemented by international organizations and has managed the facilities within its legal authority.

2) Department of Management and Planning of Water resources (DGPRE) : DGPRE was separated from DEM in 2003 and has been conducting surveys, planning and management of water resources such as groundwater and surface waters. It is also developing hydrological observatories and groundwater level observation facilities. The observation networks on Gambia River, Senegal River and boreholes were gradually installed since 1970. Some of the data collected by the networks, however, have not been updated due to the lack of budget.

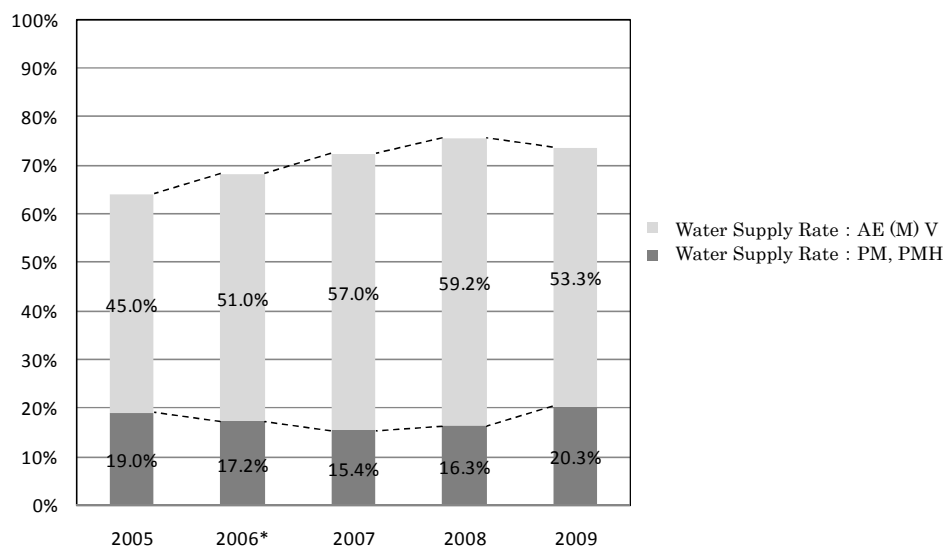
3) Department of Development and Maintenance (DEM) : DEM is mainly in charge of the management and maintenance of the water supply facilities and strengthening of the beneficiary autonomous organizations.

#### 2.1.2 Water Supply Program

The Senegalese government has considered the millennium program concerning water and sanitation, PEPAM Programme d'eau potable et d'assainissement du millénaire (2004), to be the most important program in the water sector. PEPAM aims to achieve the following three targets.

- (1) To raise the access rate to safe water in rural areas from 64% in 2004 to 82% in 2015 by newly securing sustainable supply of safe water to 2,3 million people.
- (2) To improve the access rate to sanitary service in rural areas from 26,2% in 2004 to 63% in 2015 by installing automatic removal equipment for excrement and human sewage at 355 thousand households.
- (3) To equip main public places such as schools, health care centers, weekly markets and bus terminals, with totally 3360 public toilets

The bureau of PEPAM has been carrying out formulation of manuals contributing to construction of water supply facilities and information management such as annual review of actual construction works. According to PEPAM's reports, the water supply rate in rural areas has been gradually increasing since 2005 and the target is likely to be achieved even though the rate has dropped in 2009 (Figure 2-1-1) .



Source : REVUE ANNUELLE CONJOINTE, PEPAM (2006, 2008, 2009, 2010)

Figure 2-1-1 Trend of Rural Water Supply

In PEPAM, the four water supply systems shown in Table 2-1-1 and groundwater are considered to be safe water for drinking. They are classified into Pipeline-based water supply facility (AEMV, AEV) or Point source type water supply facility (PMH, PM)

Table 2-1-1 Type of Water Supply System by PEPAM

Water supply system			Feature
Pipeline-based water supply facility	AEMV	: Addiction d'Eau Multi-Village : Multi-village Water Supply System	To provide main village and its surrounding villages with water from elevated water tanks.
	AEV	: Adduction d'Eau Villageoise : Village Water Supply System	Alternative of AEMV. To provide main village with water from elevated water tanks.
Point source type water supply facility	PMH	: Pompe à Motrice Humaine : Borehole fitted with handpump	To use borehole fitted with handpump as water source.
	PM	: Puits Moderne protégé : Improved shallow well	To use shallow well of which top is covered with concrete as water source.

## 2.2 Overall of Sanitation Sector

### 2.2.1 Present organization

Present organizations of the rural sanitation sector of Senegal are the Department of Rural Sanitation (DAR : Direction de l'Assainissement Rural) of the Ministry of Urbanization and Sanitation, and the National Service for Hygiene (SNH :Service National de l'Hygiène), Regional Service for Hygiene (SRH : Service Régional de Hygiène) and Regional Hygiene Squad (SBH : Sous-Brigade de Hygiène) of the Ministry of Health and Prevention.

(1) Department of Rural Sanitation (DAR : Direction de l'Assainissement Rural)

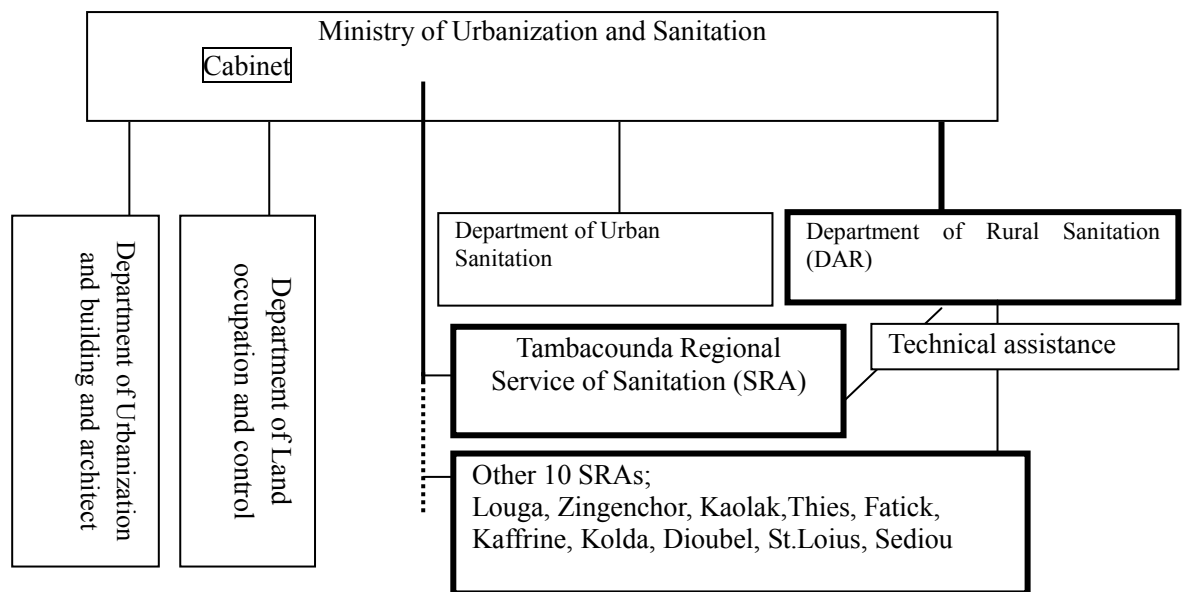


Fig. 2-2-1 Organizational Chart of Department of Rural Sanitation (Source : Document of DAR)

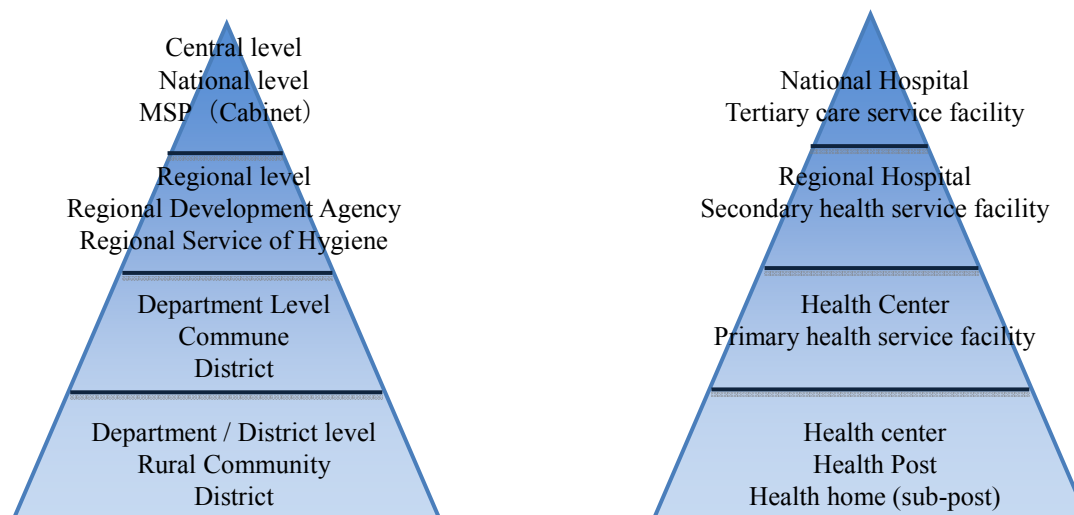
Currently, sanitation components of rural water and sanitation projects are supervised by DAR and SRAs, that is under the ministry's cabinet in the project field. Eleven (11) SRAs have already established in 14 regions, those are directly controlled by the cabinet, however DAR provides those technical guidance and assistance for SRAs.

The main objective of DAR is; as for new orientation of public sanitation sector, to reduce the half of population that do not have an access to adequate sanitation system by the year 2015 in order to accomplish the MDGs target.

Since the year 2005 after PEPAM launched, we have several times of ministry modification in Senegal government, but DAR's responsibilities still remain as its originals. Main tasks of National Urban Sanitation Agency (Office National de l'Assainissement du Sénégal ; ONAS) are in charge of operating and managing sewer networks and drainage. There are 5 regional stations (St. Louis, Thies, Kaolack, Dakar and the Dakar's Satellite areas such as Rufisk- Sally) .

(2) Ministry of Health and Prevention (MSP : Ministère de la Santé et de la Prévention)

On the other hand, in the Ministry of Health and Prevention, health services for the nation are provided on a decentralization basis similar to other African countries. The structure of health services, as a referral system, corresponds to the local administrative structure.



source : MSP's internet home page <http://www.sante.gouv.sn/spip.php?article84>  
 Fig 2-2-2 Health service pyramid in Senegal

SNH of MSP is the main authority for supervision of health and sanitation promotion activities : promotion for latrine construction, monitoring of sanitation condition and execution of disease prevention activities such as cholera/malaria eradication projects. BRH and SBH have responsibilities for execution and promotion at the regional level. In addition, BRH and SBH have been the main authorities for sanitation projects until year 2009, due to the delay in establishment of SRAs under the Ministry of Urbanize and Sanitation in each region.

### (3) Executing Structure for rural sanitation projects

In PEPAM's framework, the executing structure of the sanitation portion in water and sanitation projects is as follows : DAR is as the executing agency, the construction works of sanitation facilities is executed under DAR/SRA's supervisory body, and hygiene promotion and guidance on latrine construction in villages are conducted in collaboration with DAR's in charge of IEC (Information Education and Communication) and BRH/SB staffs<sup>1</sup> at the project sites.

### (4) Roles of ASUFOR during construction of on site sanitation facilities in villages

For January 2011, ASUFOR is placed as the main actor such as a purchaser and a supervisor for sanitation facilities in villages. With that circumstance, they will cover their responsibility not only for water supply service but also for equip those sanitation facilities. As for that, hygiene and sanitation related component (basic knowledge on faecal-oral transmitted disease and those prevention, function and roles of on-site sanitation facilities, its necessity and maintenance method, as well as hygiene and health promotion activities for making behavioural change towards village population accompanied with sanitation ladders, etc.) should be added in the actual training programme in order to establish, re-forming the ASUFOR in village. With the basic knowledge on hygiene and sanitation, it is expected the ASUFOR members will work together with Community Health Workers (Relais féminine) for improving village's environment improvement.

### (5) The main constituent of on-site sanitation facilities constructor

For January 2011, there is a tendency of selecting GIE for the main constituent of on-site sanitation facilities construction in the DAR (Department of Rural Sanitation). This tendency has been occurred based on their philosophy formulated through their experience of projects : in order to eliminate the villagers' unfairness emotion against the mason (technician) as it because only himself is able to obtain

<sup>1</sup> source : REVUE ANNUELLE CONJOINTE, PEPAM (2010) "PEPAM-RAC", P 26~



certain amount of “project budget”. The others are to exclude the construction risk, such as unfinished works and unguaranteed quality of those facilities. It is needed to make good coordination with a project partner and to achieve consent to select the constructor of sanitation system in target villages, with consideration of social, economic, and geographic conditions. (See Figure 8-4-1 in 8.4.1 of Chapter 8, Summary Report)

## **2.2.2 National Policy and Strategy related to Sanitation**

### **(1) National Plan**

The National Plans for Water and Sanitation in Senegal are stateDAR, “The 9<sup>th</sup> Economic Development Plan”, “Special Water Sector Plan (PSH)”, “Millennium Development Goal (OMD)”, “Poverty Reduction Strategy Paper (DSRP), Poverty Reduction Strategy Paper II (DSRP II)”, “Long Term Water Sector Project (PLT)”, The Millennium Water and Sanitation Program (PEPAM 2015), and Sectoral Policy Letter for urban and rural water and sanitation that was updated along with PEPAM 2015. Among of those, PEPAM 2015 is the main program of Senegal’s water and sanitation that defines the conceptual strategy for achieving the OMD object, integrated with other related policies and strategies for water and sanitation. Nevertheless, the achievements of those strategies and plans are to ameliorate the rural environment and human resources development through a technical package approach of water and sanitation issues.

### **(2) Local Plan for Water and Sanitation (PLHA)**

The Local Plan for Water and Sanitation is developed at the local level of Rural Community (Communauté Rural=CR) which is the administrative body most closely related to the community life. This plan can be placed as one component of the Local Development Plan concerning water supply and provision of adequate sanitation systems. To start implementation, Senegal's 'Millennium Water and Sanitation Program' (PEPAM) produced a local development plan tool for rural areas, named PLHA, with financial and technical assistance from WSP-Africa. The PLHA framework is used to produce inventories of local water supply and to set priorities. With the tool, CRs will be able to identify the current situation in the target area and to obtain their updated inventory. Through those outputs, CRs are able to make their own water supply development plans such as their water demands, project planning investment plans and action plans.

### **(3) National Health Development Plan (Plan Nationale de Développement Sanitaire : PNDS 2009–2018)**

The national plan for health development of the Ministry of Health and Prevention is the National Health Development Plan based on the willingness to achieve the PRSP II and the MDG. The plan’s overall goals are : 1) Reduction of infant, maternal, and child mortality rates as well as their morbidity rates, 2) Reduction of morbidity rates of major diseases starting with Malaria and HIV/AIDS, 3) establishment of a robust health system, and 4) Improvement of health sector governance. Based on this PNDS, various programs have been expanded under the Ministry of Health. It is hoped hereafter that activities to reinforce and enhance health education to achieve the overall goal number 2) of PNDS are continued in collaboration with projects of the water supply and sanitation sector.

## **2.2.3 Rural sanitation and hygiene related legal system**

### **(1) Law for public water supply and sanitation service : Loi portant organization du Service Public de l’Eau Portable et de l’ Assainissement collectif des eaux uses domestiques : SPEPA (Law no : 2008-59, submitted on 24<sup>th</sup> September, 2008)**

With the establishment of SPEPA law, a new trend can be expected, because the rural sanitation sector is forced to introduce a wide choice of appropriate technologies. Therefore, how unsettled issues such as specifications for “rural household sewage treatment service” (such as evolution and ease of latrines standard, specification of household’s drainage, etc.) and implementing structure (clarification of service provider for sewerage treatment, the private sector participation propriety and standards, etc.) are to be regulated; whether ONAS will be able to intervene and provide public sanitation services in

semi-urbanized rural areas where service providers are presently absent; and whether the organization and authority of RSAs that have been established in full scale since 2009 can be reinforced need to be carefully considered.

#### (2) Sanitation Code (Code de l'Assainissement)

The promulgation of the decree, specifications of direct or indirect discharge, runoff, deposition, disposal, landfill, sedimentation for urban industrial, household, medical waste and liquid waste is defined. Furthermore, definition is given for each task for ONAS, local authority and nation concerning to rain water and drainage in this law. As the settlement of SPEPA is under going, it must be paid attention whether some issues for basic urban public sanitation might be added.

### 2.2.4 Execution approach in Rural Sanitation Sector in Senegal

In order to improve the sanitation condition in rural area is also required the construction of improved household sanitation facilities (remove excreta and waste water) as well as public sanitation system, and for both each target access rate has been settled up in PEPAM2015. (See 2.1.2 of Chapter 2)

As for accomplish the MDG target, Senegal Government decided to execute the construction of sanitation facilities in rural areas with the budget that should be covered by mutual responsibilities of each actor in this sector, based on the new idea of that the amelioration of sanitation condition is the one concrete component of water and sanitation project.

#### (1) Parties of budget responsibilities

- Nation : Execution of BCI (Budget consolidé d'investissment; Consolidated budget for investment)
- Local Authorities (CR/Commune) : execution of local authorities budget, budget of decentralization thought BCI.
- Users (citizen/population) : contribution for public toilettes construction, share expense for construction household sanitation facilities.
- Development partner : Execution of budget of cooperation project, assistance for decentralization, program execution by NGO.

#### (2) Expenditure allocation

Construction	Allocation	Percentage	Rest
Public toilettes	Local authorities	About 10%	Nation / a part will be bearded by contribution
Household felicities	Household	About 10%	Nation / Partners / NGO

### 2.2.5 Safe and appropriate sanitation facilities definition and target accessibility in Senegal

Access to safe and adequate sanitation is defined as "the possibility of daily access to technology and facilities to remove excreta and domestic wastewater through hygienic practices" in PEPAM, a major development programs in Senegal.

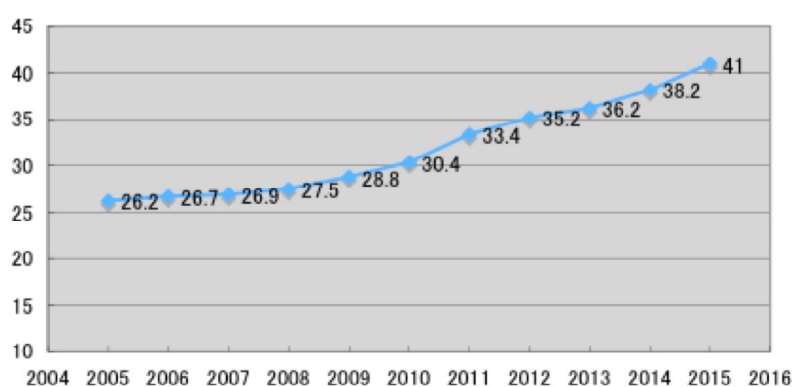
At the annual report meeting for year 2009, the fifth year after the start of the PEPAM, revisions were made to issues on the rural sanitation sector. Major revisions were made to the relaxed definition of safe and adequate access to sanitation in rural area, as well as specifications and standards according to the Joint Monitoring Programme (JMP) of WHO / UNICEF.

Definition of UNICEF/WHO's safe sanitation facilities are stated in the table below:

Table 2-2-1 Definition by Joint Monitoring Programme (JMP) UNICEF/ WHO

Improved sanitation facilities	Non-improved (unsafe) sanitation facilities
Definition : Sanitary facilities which can prevent population from contact with excreta	Definition : Sanitary facilities which cannot totally avoid population from contact with excreta
<ul style="list-style-type: none"> <li>• Flush toilette with:               <ul style="list-style-type: none"> <li>- Sewer system connection</li> <li>- Septic tank</li> <li>- Waste pit</li> </ul> </li> <li>• Ventilated improved pit (VIP) latrine</li> <li>• Pit latrine covered with slab</li> <li>• Composting toilet</li> </ul>	<ul style="list-style-type: none"> <li>• Flush latrine with uncontrolled drainage</li> <li>• Pit latrine without slab and open cover</li> <li>• Bucket or other containers</li> <li>• Hanging toilet or hanging latrine</li> <li>• No facilities or bush or field (open defecation)</li> </ul>

The upcoming launch of the project fixed until April 2009, and with these modification, the undergo of access rates will be expected as follows.



(source : REVUE ANNUELLE CONJOINTE2009, PEPAM)

Fig 2-2-3 Evaluation in access rate of sanitation systems (including assumptions)

This indicates that at this stage, with the projects of other donors and national projects those budgetary committed, the goal will not be achieved. And it highlights the need for supplements on the budget. However, changes in strategy and the easing of requirements has resulted in changes of direction in the construction of sanitation facilities (as latrines).

## 2.2.6 Senegal's target for improvement of sanitation condition

### (1) Changes in national average

Le taux d'accès à l'assainissement en milieu rural du PEPAM conjecture les évolutions suivantes

Table 2-2-2 Access Rate of sanitation in rural areas (including speculation)

2005	2009	2010	2015
26,2%	28,9%	30,1%	63,0%

source : REVUE ANNUELLE CONJOINTE2009, PEPAM

Improvements speed in sanitation is relatively low, and it should be noted that in rural areas the installation of public toilettes and individual latrines are hardly progress. One reason is that there is a citable trend in donors, and funds are provided rather water supply projects than sanitation project. But there is no immediate measure for this inadequate funding.

### (2) Access rate for improved sanitation system in those three target areas

According to PEPAM coordination unit (PEPAM-UC), those access rate for improved sanitation facilities in each target region in year 2010 is as following;

Table 2-2-3 Access rate for improved sanitation facilities in three regions

Region	Access rate
Tambacounda	21,2%
Matam	14,4%
Kedougou	5,6%

Source : PEPAM-UC, 2010 Mars

### 2.2.7 Other trends for improving sanitation conditions in Senegal

(1) CLTS Approach (Community Led Total Sanitation) : A trial in the region of Tambacounda cooperation by UNICEF, WSP and DAR

The CLTS action plan was established jointly by the DAR and PEPAM to improve the rate of access to safe sanitation, in order to achieve the Millennium Development Goals (MDGs). The CLTS approach is not applied to individuals, but for villages or communities, 1) with small populations, 2) remotely located, 3) where the proportions of open-air defecation is high, and 4) with scarce donors' support due to the above reasons. According to a village chief who was involved, he is aware of the decline in child diseases and the necessity for each household to possess at least 1 or 2 "functioning" latrines.

(2) Issues to be considered

The problems or issues concerning CLTS that need to be shared in Senegal are the following.

#### 【Problem on Specifications】

The inhabitants of each household in charge of the construction of latrines in the CLTS are not subject to strict supervision of the execution. It is feared that adequate instructions for construction of facilities are not provided by the facilitator, who is a supporter of the execution agency in the community. At the construction stage in CLTS, fears arise in which the number of unsafe facilities will increase as a result of continuous construction of traditional latrines.

#### 【Problem on Economic Issues】

Since the current trial is being conducted in villages selected on the basis of the above conditions, we must study whether there will be effect on residents in the village, where total sanitation project is proposed, where there is competition between other donors and funds for partial financial assistance to construction costs, or where the economic conditions are very poor.

#### 【Social and Cultural Issues】

If the introduction of CLTS has been decided on the basis of villages with socio-cultural background, it is necessary to analyze whether the construction of public latrines needs to be stopped or not.

#### 【Problem on Equity】

After the introduction of CLTS, if new projects for further improvement of sanitation conditions is to be raised in the future in the same villages, they should be examined on whether there are no inequities with households who first built their latrines at their own expense in CLTS activities.

(3) Position in Senegal

Concerning those issues above, study team took the problem on specification of facilities as the highest issues to be analyzed in Chapter 8, 8.3.4 in Main Report. However, through the validation seminar on the final report of evaluation for pilot project of CLTS in Bani-israel, held by DAR/UNICEF on 19<sup>th</sup> January 2011, shared awareness as "sensitizing approach for behaviour change" was raised on CLTS approach. As for the detail of total evaluation for whole project shall be waited until the time of final report publish, but those principal ideas are confirmed and shared by participants through discussion

session, such as introducing of CLTS is to be a lowest step even entrance of sanitation ladder and those latrines, which constructed by village population through CLTS activities, would not contribute to the access rate of PEPAM.

## 2.3 Socio-economic Conditions

### 2.3.1 Population

The population of Senegal is 11,84 million and the target area, which is composed of 3 regions, takes up 10,5% of the population. The population age distribution in Senegal is a pyramid type with population aged 20 and below occupying 53,3%. The same condition is seen in the target area. As for the population density, however, while the national average is 60 persons/km<sup>2</sup>, it is 15 persons/km<sup>2</sup> in the target area.

Table 2-3-1 Population of the target area

Target area	Population (2008)
Tambacounda	613066
Matam	506921
Kedougou	122333
Total of 3 regions	1242320
Senegal	11841123

Source : Situation économique et sociale du SENEGAL 2008 (ANSD),  
Situation économique et sociale de la région de TAMBACOUNDA 2008 (ANSD),  
Situation économique et sociale de la région de MATAM 2007 (ANSD)

### 2.3.2 Industry and Income

#### (1) Industry

The percentage of the gross domestic product (PIB) accounted for each industry in Senegal are 16,3% for primary industries, 18,8% for secondary industries, 52,9% for tertiary industries, and 12,0% for custom duties.

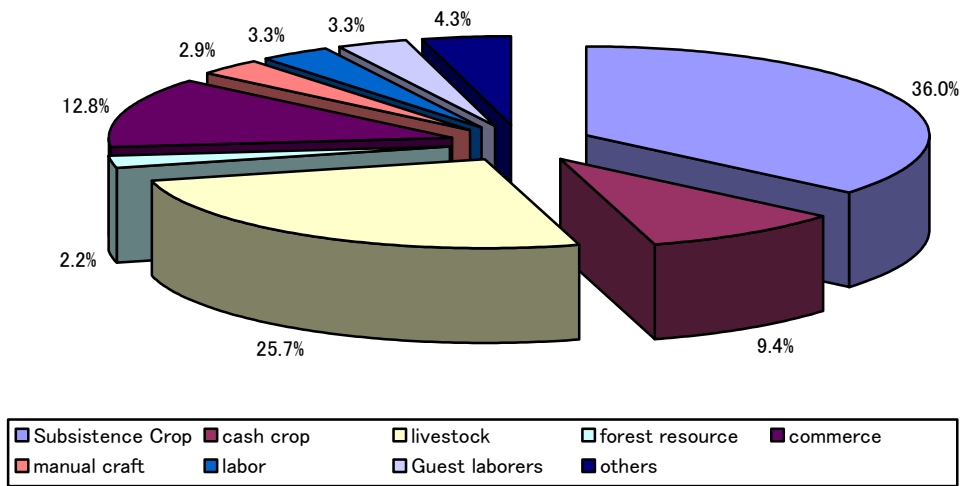
In the target area, primary industries account for over 70%. While agriculture takes 50 to 60% in Tambacounda, and in Matam, livestock industry has a bigger percentage than agriculture. (Table 2-3-2)

Table 2-3-2 Primary Industries in the target area (%)

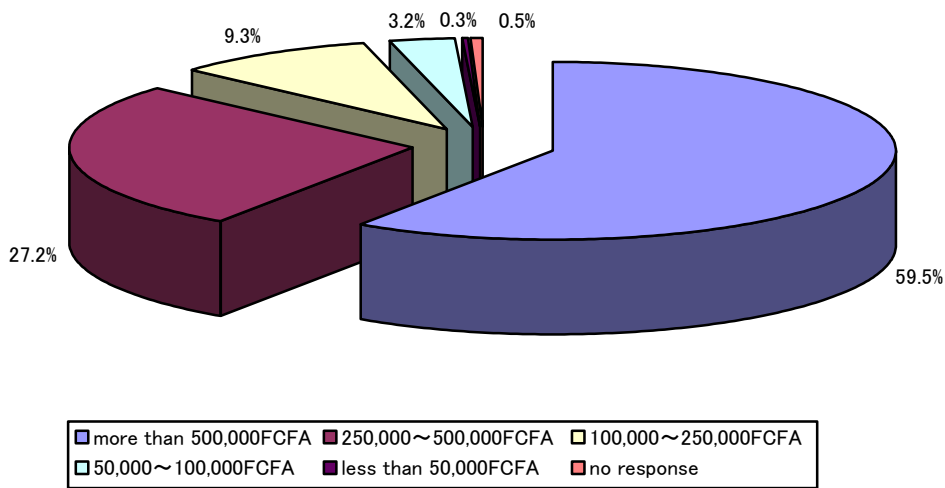
Region	Department	Agriculture	Livestock	Commerce	Handicraft	Salary	Fishery	Others
Tambacounda	Bakel	51,4	27,4	12,1	1,0	1,4	0,8	5,9
	Tambacounda	62,6	22,8	6,8	0,8	2,7	0,4	3,9
Matam	Kanel	43,5	37,1	9,4	5,3	1,3	3,2	0,1
	Matam	39,8	37,1	13,0	2,3	3,7	3,2	1,0
	Ranerou	28,1	46,0	25,1	0,0	0,8	0,0	0,0
Kedougou	Kédougou	58,4	15,2	7,5	3,8	3,1	0,2	11,7

#### (2) Income

In the target area, the percentage of households whose annual incomes are less than 500,000 FCFA account for more than 40% (Figure 2-3-2). If we assume that one family's expenditure is 500,000FCFA a year and there are 17,3 members in the family, one family member is supposed to survive on 79,2 FCFA (equal to 15,3 Japanese yen) a day.



(Source : Social and Economic Survey)  
Figure 2-3-1 Breakdown of Source of income



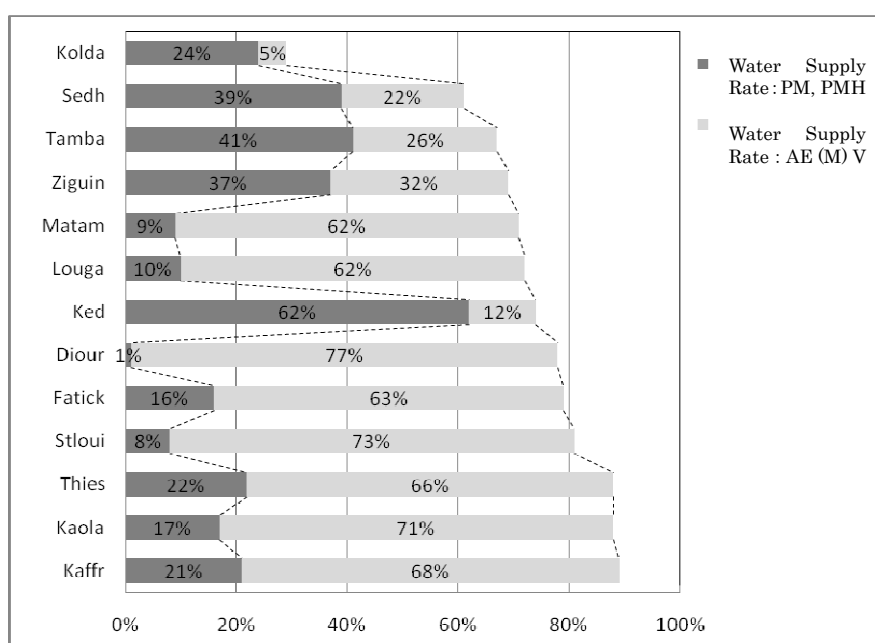
(Source : Social and Economic Survey)  
Figure 2-3-2 Average annual income per household

## 2.4 Current Conditions of Water Supply Facilities

### 2.4.1 Features of water supply facilities in rural areas of Senegal

#### (1) Proportions of water supply facilities

Even in rural areas, water supply rate by pipeline-based facilities, which consist of AEV and AEMV, is high in Senegal. While AEVs supply water to single villages, AEMVs aim to supply water to multi-villages. There is a tendency that water supply rate by point source type, which consists of PMH and PH, decreases against the improvement in total water supply rate. In Kedougou Region, located on basement rock areas, however, the percentage of point source type water supply facilities, of which the amount of pumped water is small, accounts for more than 60% because it is difficult to develop water resources in this area.



Source : REVUE ANNUELLE CONJOINTE2010, PEPAM

Figure 2-4-1 Breakdown of water supply facilities type for each department in 2009

The water supply rate of 82% in the objective 2015 of PEPAM, PM is included in the view of reality of the villages. However the PM isn't considered as ideal facility, but is defined as "reasonable".

Tableau 2-4-1 Décomposition des types d'ouvrages hydrauliques dans la définition par PEPAM

Evaluation by PEPAM on the type of facility	Not ideal, but acceptable facility		Reliable facility for drinking water		Total rate
	Type of facility	PM*	PMH*	AEV	
DHR policy	New construction is suspended	In case discharge of borehole is not enough	Recommended		
PEPAM policy	less than 500 habitants	Less than 500 habitants	Population more than 500 habitants		
Tambacounda		30%	11%	26%	67%
Matam		8%	1%	6%	71%
Kédougou		3%	59%	12%	74%

\* It is calculated according to the value announced by PEPAM estimating ratio of the PM/PMH.

## (2) Water supply system

Rural water supply systems in Senegal are classified into nine types which corresponds to three of Point source types, three of Village water supply system AEV and three of Multi-village water supply AEMV. While the proportion of Point source type facilities is small as Figure 2-4-1 shows, traditional shallow wells and improved shallow wells exist in uncountable numbers and they are used together with pipeline-based water supply facilities.

Table 2-4-2 Representative water supply facilities (Point source type)




Water supply type		PT	PM	PMH
Intake facility	Well type	Shallow well	Shallow well	Borehole
	Water source	Groundwater/underflow water (unconfined groundwater)	Groundwater/underflow water (unconfined groundwater)	Groundwater (confined groundwater)
	Pumping system	Drawing by hand/pulley	Pulley/handpump	Handpump
	Power source	Human power/livestock	Human power/livestock	Human power
Distribution facility		—	—	—
Risk of pollution		Contaminated	Contaminated	No contamination
Water supply facility		Basically, there are no public faucets and vehicle watering posts, but some facilities attach watering places for livestock.		
Special note		<ul style="list-style-type: none"> <li>• Hand dug with no concrete lining. Some do not have above ground collars.</li> <li>• PEPAM does not consider shallow wells without concrete lining to be appropriate water supply facilities. However, countless number of traditional shallow wells have been constructed in the target area and are utilize DAR daily life water sources.</li> <li>• In the areas where static water level is shallow, most households have shallow wells because of the easiness in their construction. As a result of that, some villages have tens of shallow wells.</li> </ul>	<ul style="list-style-type: none"> <li>• Inner walls are concrete lined, and fitted with above ground collars and aprons with drainage.</li> <li>• Residents periodically ask specialists to scrape out sand from the bottom of the shallow wells.</li> <li>• Some villages in inland of Matam Region like Ferlo have 50m or deeper static water levels and horses are used to draw water by using pulleys.</li> <li>• Handpumps are installed in some shallow wells.</li> </ul>	<ul style="list-style-type: none"> <li>• Boreholes fitted with handpumps are constructed mainly in Kedougou and southeast part of Tambacounda region located in basement rock areas.</li> <li>• Although types of handpumps are not officially designated, there is a tendency to use India Mark II.</li> <li>• In cases where static water levels are deep, some handpumps have extension handles welded on so that residents can easily pump up water.</li> </ul>
Facility appearance				



Table 2-4-3 Representative water supply facilities AEV







Water supply type		Village water supply system Ordinary type	Village water supply system Solar powered type	Village water supply system Type with purification facility
Intake facility	Well type	Borehole	Borehole	Intake Well
	Water source	Groundwater (confined groundwater)	Groundwater/underflow water (confined groundwater)	Surface water
	Pumping system	Vertical axial pump/ Submersible pump	Submersible pump	Submersible pump
	Power source	Generator	Solar energy generation	Commercial power/Generator
Water purifying facility		None	None	Purification/Disinfection
Distribution facility	Water tank	Ground tank	Elevated water tank	Elevated water tank
	Piping network	None or Short line	Installed	Installed
Water supply facility		Generally, public faucets, livestock watering troughs and vehicle watering posts are installed. However, some of them do not install livestock watering troughs or vehicle watering posts.		
Special note		<ul style="list-style-type: none"> <li>Deteriorated facilities which have lapse more than 20 years after construction generally cannot meet water demands.</li> </ul>	<ul style="list-style-type: none"> <li>This system is appropriate for medium scale villages whose populations are several thousands.</li> <li>Japan and KfW have constructed this type of system and recently, EU is also following their construction. As a result, this type of facilities is increasing.</li> </ul>	<ul style="list-style-type: none"> <li>The water-purifying system in Kassac Nord is a representative example.</li> <li>Appropriate maintenance and management is indispensable because it has to provide sufficient water to meet demands even in the dry season.</li> </ul>
Facility appearance				

Table 2-4-4 Representative water supply facilities AEMV

Water supply type		Multi-village water supply system; Ordinary type	Multi-village water supply system ; Water treatment type	Multi-village water supply system ; Long distance type
Intake facility	Well type	Borehole	Borehole	(Multiple) Boreholes
	Water source	Groundwater/underflow water (confined groundwater)	Groundwater/underflow water (confined groundwater)	Groundwater (confined groundwater)
	Pumping system	Vertical axial pump/ Submersible pump	Submersible pump	Submersible pump
	Power source	Commercial power/Generator	Commercial power/Generator	Commercial power
Water purifying facility		None	Iron removal facility/Disinfection	None
Distribution facility	Water tank	Elevated water tank	Elevated water tank	Elevated water tank
	Piping network	Installed	Installed	Installed (long distance)
Water supply facility		Generally, public faucets, livestock watering troughs and vehicle watering posts are installed. However, some of them do not install livestock watering troughs or vehicle watering posts.		
Special note		This system is the most common pipeline-based water supply system in Senegal. Most old ones use engine-driven vertical axial pumps. They provide water for main village and its surrounding villages.	Iron removal system in Matam (SDE) water purifying plant is a representative example. The amount of water to meet demands needs to be pumped up and regular maintenance of the iron removal system is required.	The systems in Ndiok Sall and Noto Palmarin are representative examples. Total length of distribution pipelines are more than 100km and the daily amount of supplied water exceeds 1000 m3.
Facility appearance				

### (3) Operation of facility

#### (1) Operation of water supply facilities

According to the government's policy, it was determined that ASUFORs would operate water supply facilities. As the result, for existing water supply facilities, a shift of operation has been advancing from water management committees previously in charge of operation to ASUFORs. Water management committees are voluntary organizations and particulars of operation and management are not clearly defined. Meanwhile, ASUFORs are stipulated by law and have a status of legal entity and they set out to have a function to be able to conclude contract with private-sector participants. In addition, ASUFORs are different from water management committees in that they have clearly-stated particulars to maintain transparency of operation.

Furthermore, as consideration for sustainable maintenance and operation of water supply facilities, ASUFORs try to accumulate funds by placing burden of water fee fairly on users through the adoption of a metered-rate system and by establishing water prices to cover necessary costs for future replacement of pumps and facility maintenance. Although some water management committees have functioned effectively in a way similar to ASUFORs, they are highly dependent on human factors, that is, individual's capability. For ensuring transparency, at each committee, representative officials are regularly elected and reelected and rules are in place for convening residents' regular assemblies and for preparing accounting reports.

### 2.4.2 Outline of the target area

#### (1) Tambacounda Region

Water supply coverage rate in Tambacounda is 67% in 2009. The breakdown is, point source type water supply facilities, 41% and pipeline based water supply facilities, 26%. This figure falls much below the national average coverage rate of 84% and is in the bottom three in Senegal.

In Tambacounda region, water supply coverage rate by point source type is higher than that for the pipeline based type.

This is because it is difficult to secure enough water for pipeline based system in basement rock areas and therefore development of pipeline-based water supply facility in this area is delayed.

Western and southwestern parts of Tambacounda Region have low water supply coverage rates. Especially in Kahene, Maka Coulibantang and Ndogo Babacar communities located in the southwestern part, water supply coverage rates are lower than 40%. DHR has also considered that these areas are prioritized areas for improvement of water supply.

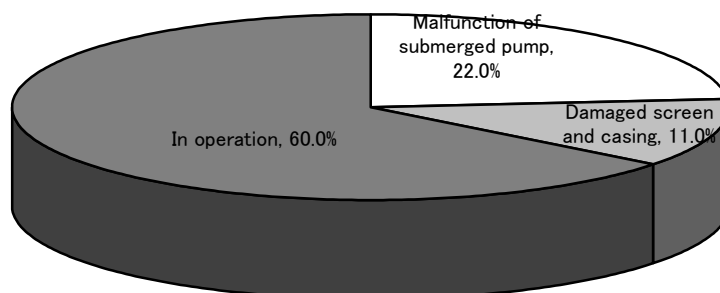
According to the results of interviews with BPF, which were conducted as part of the current condition survey, one third (24 out of 72) of the pipeline-based water supply facilities are suspended in Tambacounda. The operational rate in Tambacounda is far below the national average operation rate of 91,8%(Table 2-4-5). Two thirds of the suspensions are caused by malfunctions of pumps or generators and remaining one third are caused by broken screen pipes or casing pipes. Some of the facilities, which were constructed more than ten years ago, have generator problems every month and some of them have been temporarily suspended.

When the suspension is caused by malfunction of submersible pumps, most of the facilities have been abandoned due to difficulties for repairing or replacing them. In the boreholes which are more than 30 years old, screen pipes and casing pipes have been mostly damaged making them difficult to pump up water due to sand influx into the boreholes. For the facilities in this condition, it is necessary to drill another borehole. However it is beyond the ASUFOR's work range and they cannot handle these situations. As a result, the facilities have been just abandoned.

Table 2-4-5 Operational rate of water supply facilities of each BPF (%) as of 29<sup>th</sup> January 2008

	Western Part of Tambacounda Region : Tambacounda	Eastern Part of Tambacounda Region : Goudri	Kedougou	Matam	National Average
Number of AEP sites	72	57	17	81	-
Number of suspended sites	24	14	4	11	-
Operational rate	66%	75%	76%	86%	91,8%

Source : REVUE ANNUELLE CONJOINTE2009, PEPAM (2009) and interview to BPF



Source ; Interview to BPF

Figure 2-4-2 Operational rate and cause of suspension of the facilities

Survey for existing conditions was conducted in two areas which have low water supply coverage rates. One is southwestern part of Tambacounda region, which has the lowest water supply coverage rate, and the other is northwestern part of Bakel located on basement rock areas. Not only malfunctions of facilities but also leakages due to deterioration are identified. Leakages from valves attached to each facility such as elevated water tanks, public faucets, livestock watering troughs and vehicle watering posts are especially conspicuous. In addition, existence of facilities which do not meet water demands was confirmed. The survey team also identified the fact that some of the facilities need additional public faucets and extension of distribution pipes.

## (2) Matam Region

Matam region is grouped into three areas : 1) Area along Senegal river, 2) Area along the national road and 3) Inland area. This region is composed of 14 communities (CRs). While villages in three communities of Oudalaye, Lougre Thioly and Velingara located in the inland area have populations of less than 200 on average, villages in the area along Senegal river and the national road have populations of about 1 000 on average. Thus, in terms of population, the inland area is greatly different from the area along the national road (or the area along Senegal River) .

As for water supply coverage rate, in the areas along Senegal river and the national road, the rate is higher than 80% since access to the areas are easy and investment effect is high. However, for communities in the inland areas like Lougre Thioly and Velingara which are far away from the main road, their coverage rates remain at the 50% level. Compared with other regions in the target area, water supply by extending pipelines from the main village is more common in Matam region (Table 2-4-3 Public faucet : BF) and the operational rate is the highest in the target area. This is related to the fact that extension of distribution pipes and replacement of submersible pumps are conducted with funds contributed by the migrant workers organization. This situation characterizes the water supply system in Matam. As another feature of this region, many facilities which adopt solar generation are developed by EU supported PSRII (2005-2008). Maintenance and management including repairs is entrusted to specialty private companies since its construction stage.

## (3) Kedougou Region

Kedougou region has a higher proportion of PMHs since the region is located in the basement rock area and does not have enough potential for pipeline based groundwater development. The average population of villages in Kedougou is around 300. Therefore, one PMH can meet the village water requirements. As a result, the region has the highest water supply coverage rate in the three regions of the target area even though it is located in the remote, frontier area.

Concerning maintenance and management, collection of water charges for handpump use is not carried out and it is common to collect money from beneficiaries when money is needed for repairing. The results of interview with BPF reveal that one tenth (20 out of 200) of handpumps are abandoned without being repaired. This situation is caused under circumstances such as low awareness for maintenance and management, non-availability of spare parts and repair shops in the region and poor accessibility to the villages.

Though water supply coverage rate by improved shallow wells is low compared to other areas, traditional shallow wells and improved shallow wells are used as daily life water sources. In some places, Gambia river and Faleme river, and in the rainy season, surface waters such as marigots are also utilized in daily life.

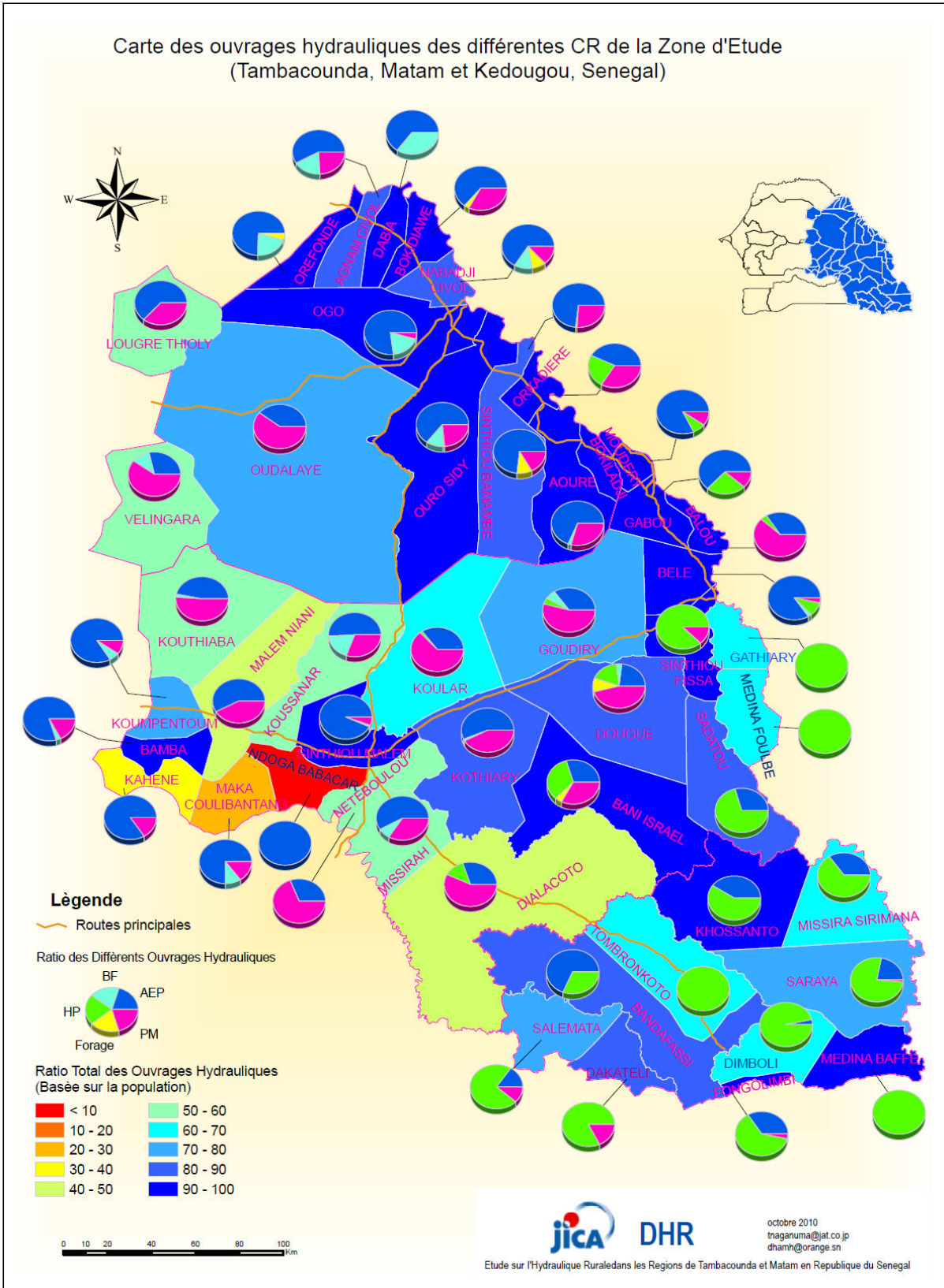


Figure 2-4-3 Water supply coverage rates and proportions of type of facilities in rural communities

### 2.5 Situation of water usage

From the results of the socio-economic survey for the target area, the situations of water usage are identified DAR described below.

### 2.5.1 Amount of water consumption

Average water consumptions in the three regions of the target area are as follows (Table 2-5-1). Per-capita volume of water consumption including drinking, cooking, washing and bathing is about 21,3l/day, (368,1 divided by 17,3, where 17,3 is the average number of family members in one household (source : socio-economic survey) )

The results of interviews with CRs and villages show that most households have tendency to use public faucets and house connections as drinking water source, and use shallow wells for cooking, washing and bathing so that their water charges will be as little as possible.

Table 2-5-1 Purpose of water utilization and amount for each purpose

Water for daily life (L/day/household)		Water for livestock (L/day)
For drinking	For cooking, washing, bathing, etc	
121,4	246,7	168,3
Total 368,1		

Source : Socio-economic survey

### 2.5.2 Collection of water charges

The way of collecting water charge for pipeline based systems is divided into two types, fixed charge type and metered type. ASUFOR has generally adopted metered type (200~400FCFA/m<sup>3</sup>) in compliance with DHR's recommendations. Conventional water management committee and some ASUFOR set their own rate. Rates for house connections vary from 300 to 400FCFA/m<sup>3</sup> according to the amount used.

Although about 60% of residents feel that the above rate in the target area is expensive, 76,6% think the way of setting the rate and collecting water charges are appropriate. It indicates that residents recognize that it is important to collect water charges in order to maintain the facilities and provide sufficient water even if it is expensive.

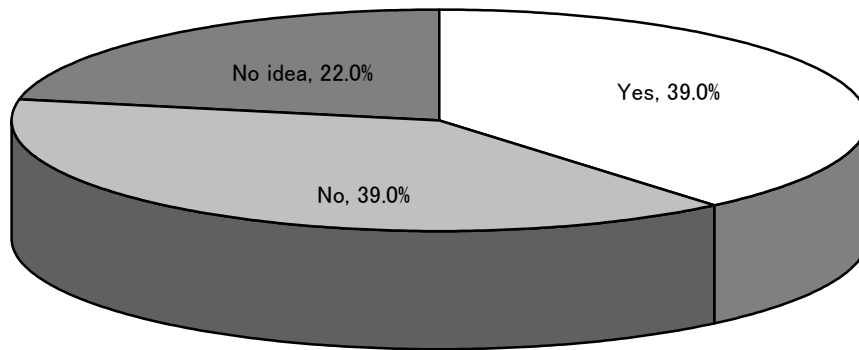
Table 2-5-2 Residents' views on water charges

If the rate for water charge is appropriate or not (%)			If the way of setting rate and collecting water charge are appropriate or not (%)	
Too expensive	Expensive	Appropriate	Yes	No
13,6	46,0	40,3	76,6	23,4

Source : Socio-economic survey

### 2.5.3 Problems in maintenance and management of water supply facility

As Figure 2-5-1 shows, 39,2% of residents answered that there is no problem for maintenance and management of water supply facilities. Percentage for each problem is : 35,4% frequent trouble of pump, 18,8% inefficiency of the management system, and 17,7% insufficient water due to increase of population. (Table 2-5-3)



Source : Socio-economic survey

Figure 2-5-1 Existence of problem in maintenance and management of water supply facilities

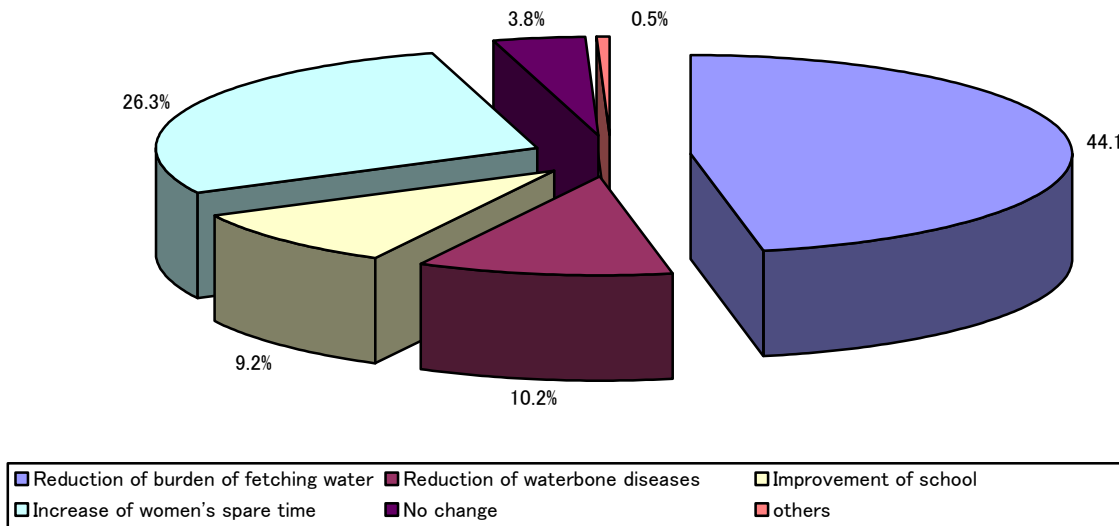
Table 2-5-3 Problems in maintenance and management of water supply facilities

Frequent trouble	Inefficiency of management system	Lack of facility capacity	Unpaid water charges	Securing fuel	Difficulty in facilities operation	Hygienic conditions	Others
35,4	18,8	17,7	6,3	5,2	4,2	2,1	10,4

Securing standby water sources should be reviewed because the results of interviews with CRs and villages show that people use shallow wells when water supply facilities have problems.

**2.5.4 Impact and changes brought by construction of water supply facilities**

Concerning impact and changes accompanying water supply facility construction, 44,1% of respondents gave reduction of burden from drawing water as the impact. Other impacts and changes were cited in Figure 2-5-2. These figures suggest that construction of water supply facilities contributes to stable safety water supply, reduction of women and children’s burden from drawing water and improvement of school enrollment.



Source : Socioeconomic survey

Figure 2-5-2 Impact and changes brought by construction of water supply facilities

## 2.6 Current situation and problems of sanitation in the target area

The difficulties to be overcome in the current situation of sanitation in the target region can be divided into the following broad categories.

### 1) Possession rate of improved latrines

The extremely low rate of ownership of improved latrines can be cited as the main problem. However most villages in this target region, over 70% of households possess their own toilets, but over 80% of their toilets are the traditional simple latrine. Since these latrines are not consistent with the definition of improved sanitation in JMP (See Table 2-2-1 in 2.2.5 of Chapter 2), the real rate of access to sanitation facilities in the target area is extremely low.

### 2) Treatment of domestic sewage

In the three project areas (inland zone, near the border zone, along the Senegal River and Gambia River), almost all households does not have provisions for the treatment of domestic sewage. We can therefore consider that the rate of access to treatment facilities for domestic wastewater is zero.

### 3) Public Health Services : garbage treatment and disposal of excreta

In addition to problems inherent to households regarding waste treatment and discharge of excreta in semi-urban (large villages, towns, county seats of local communities), where social conditions are different from those in rural agricultural area, are extremely important issues. In three target areas, the treatment of garbage in cooperation with local authorities or NGOs is done specifically in the city (commune) of Bakel in the Tambacounda region, the service being provided by a private company (GIE).

As for the excreta, only very small populations, who possess the flush with drain type toilette, are able to call a private company.

## 2.6.1 Current situation for water born disease in the target area

According to the directors of SRH or SBH and health centers in the region concerned, the main morbidity of waterborne disease are; diarrhea, dysentery and malaria, diseases caused by insects such as bilharzia, skin infections as scabies, Guinea worm disease and river blindness, diseases of the urinary tract and skin disease. However, stakeholders in the health sector at regional level very close to the communities are not aware that the above various diseases are caused by specific water sources. In other words, even if cases of infectious diseases such as cholera and dysentery, are among the many people using water from a well or spring A B, it is difficult to specify that A or B are the original sources of pathogens

## 2.6.2 Actual condition of water supply and sanitation in villages

The sanitation situation in villages in the target area is not satisfactory. Many problems remain unsolved.

### (1) Location of water source

The main sources of water catchments in the target region and issues relating to the sanitation situation are presented below.

#### 1) Motorized water supply facilities with groundwater (supplied by public faucet)

In some cases, contamination of these facilities is due to human activity, when a sufficient quality could not be insured at the time of plan and design, so that affected the cleanliness of water fetching points. Indeed, in some cases it is impossible to make enough cleaning at public faucet, for example, when it cannot be helped to place the valves below ground level due to a lack of water pressure, therefore not only the cleaning, but also for operation and maintenance become difficult.



2) Public shallow well (puits) in the village and puits in a household (mostly used collectively with the neighboring families)

They are mostly contaminated by human activities. Regarding the structure of the wells, traditional wells are numerous and because their edges are not protected by concrete or cement, they are polluted by muddy water, also in many cases, their surroundings are not clean. In addition, no barrier is installed around the shallow wells to protect against ingress of livestock that can get very easily at the well. The potential for contamination from cattle dung are therefore extremely high.

In addition, litter can easily enter into the wells without protective covers and birds or bats will sometimes make their nests. It can be also shown as problems caused by human, as is the release of wastewater from the laundry done near the shallow well, injecting a disinfectant chlorine directly into the wells according to incorrect knowledge, thus population think that the water is potable without having a simple treatment, or continued use of buckets and rope dirty and unhealthy for fetching water.

Moreover, the study of water pollution of shallow wells completed in the target area in year 2008 revealed that almost all the shallow wells are contaminated with coliform. Levels above the WHO guidelines have been checked for nitrous acid (NO<sub>2</sub>), nitric acid (NO<sub>3</sub>), ammonia, etc.. Geophysical conditions in the vicinity of mentioned shallow wells and sanitary habits of the inhabitants can be considered as the causes of this pollution.

3) Surface water and spring water

In addition, spring water and rivers are also used as an alternative water source where there are no water supply facilities. However, many water-fetching points are difficult to consider that where we can get potable water without any simple treatment method.

(2) Transportation, treatment and conservation of water

Regarding the transport, treatment and water conservation, guidance is provided on an ongoing basis by the SBH and AUC (facilitators of hygiene and health in rural communities), but it is possible to say that the contents of these guidelines have not been yet assimilated widely in rural area.

For water conservation, the introduction of improved jars is recommended. World Vision and UNICEF have begun to introduce improved jars in schools and health posts in the 1990s in the Tambacounda region, however the introduction has been made in households, but as it is impossible to obtain improved ready-made jars, diffusion did not occur in target area. Thus, in PEPTAC 2, at the request of residents, training took place for the manufacture of jars improved in villages in the Tambacounda region in February 2008, and if the supply chain is ready in the region, using safe-jar in households will be commonplace.

(3) Habitat and domestic hygiene condition

Regarding the situation of housing and household sanitation in the villages of the study area, is virtually identical. For most families, the house is located in a square surrounded by straw, sheets or a hedge. It is extended through the kitchen and the ovens are in very small numbers. In addition, the kitchen is not equipped with roof in some families and the land becomes muddy after rain, which is very unhealthy. However, the awareness of domestic hygiene has increased, it seemed to be taken root in the practices, behavior change has started to be made in everyday life.

(4) Other hygiene and sanitation situation in villages

Furthermore, in Matam region, we often see some large wadis forming like passage of rainwater. It leads large quantities of water to penetrate in the villages with grand waste, and remains without being evacuated, so that it causes to make many villages to be in squalid conditions.

In addition, in larger villages, semi-urban areas and communities along the Senegal River, waste treatment and the treatment of excrement turned into sludge are not in adequate manner, so that sanitation problems like attacking urban areas now are found in some grand village in target area. The

problem gets worse and that started to affect considerable influence on the sanitation conditions in target area.

### 2.6.3 Possession rate of sanitary facilities

#### (1) Data from the Ministry of Health

In the Matam region, the number of concessions with an adequate sanitation is zero, and for the Tambacounda region (including the region of Kedougou), the number of household possessing adequate latrine is less than half.

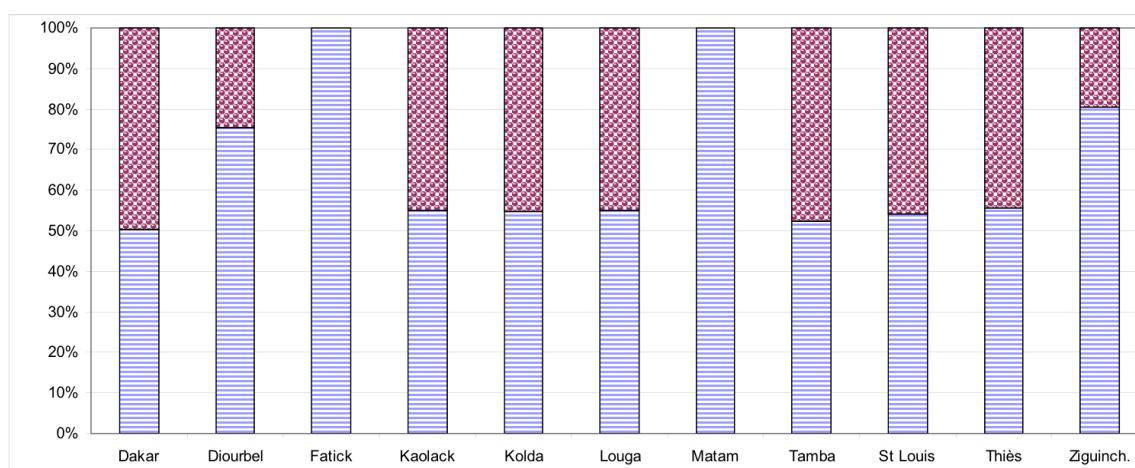


Figure 2-6-1 Breakdown of families (concessions visited) with an adequate sanitation throughout the country in 2006

#### (2) Surveys confirmed the presence of sanitation facilities in villages

Regarding the sanitation situation, the broad outlines of the results of these surveys executed in 23 households are presented in below.

##### 1) Possession of households sanitation facilities

Of the 23 families visited, only one family did not have a latrine in the compound, the remaining 22 families have either traditional latrines, improved latrines either or both types of latrines. With regard to sanitation facilities other than toilets (wash, wash, wash-sump for waste water treatment), single family owned in a single village.

##### 2) Sanitary and hygienic condition of in families

When answers on health conditions in families focused on three choices, "Good", "fair" and "bad", only two families in one of the 11 villages surveyed responded "good". However, contradictory answers have been obtained if the reasons why sanitation is considered good was sought, it was concluded that these conditions were either fair or poor for all families. The problem with the latrine more often raised by populations is the lack of safe latrines installed in families. Asked why the security cannot be ensured, the most common responses focused on two points : the fragility of the building and underground structures (excreta overflows during the rainy season, destroying the paved portion) and unable to route the barrier to spread of diseases caused by feces.

##### 3) Wishes for the improvement of hygiene conditions, intentions to participate

Wishes concerning the improvement of hygienic conditions and intentions to participate in this improvement exist simultaneously in all families. For the manner of participation, provision of work is most often mentioned, followed by the provision of locally available materials and by paying cash. In terms of cash, if all families say they can do, only a small number of families reported a limit.

##### 4) Amount possible to bear by population for the construction of facilities

The most numerous responses indicated that support from 10 to 25% of construction costs, including

the provision of labor and local materials, was possible.

5) Needs for other sanitation facilities

Regarding needs for sanitation facilities other than safe and adequate latrines, laundry facilities and installation of drain or sewage were most raised by women.

6) Public health facilities

Among the public health facilities, the largest number of responses focused on the wishes for toilets in public places. In terms of participation in the management and maintenance of these facilities, all families showed positive attitudes in this direction.

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### 3.4.6 Evaluation in Basement Rock Areas

Generally, it is important to comprehend the following items for groundwater development in basement rock areas.

- Hydrogeological structure (fault, fracture zone, etc.)
- Deep weathered zone
- Distribution of dikes and veins

Regarding basement rock areas, the groundwater potential division as shown in Table 3-4-6 is analyzed from the relation between geology and the geological structure, and the discharges of existing wells.

Moreover, the region along large and medium size rivers where the sedimentary deposit (Q aquifer) is thickly distributed and has a hydrogeological condition similar to Zone-5 in Table 3-4-5.

Table 3-4-6 Geology and groundwater potential in basement rock areas

Surface geology	Groundwater Potential	
	High	Possible
Cambrian sedimentary rocks	<ul style="list-style-type: none"> <li>• Distribution of basaltic rocks with faults and fractures</li> <li>• Distribution of pelitic rocks with dense fractures</li> <li>• (Distribution of quartz veins)</li> </ul>	<ul style="list-style-type: none"> <li>• Distribution of faults and fractures</li> <li>• Distribution of quartz veins</li> <li>• The underlying metamorphic rock is the main aquifer around Kidira-Bakel area.</li> </ul>
Cambrian volcanic rocks (Andesite)		<ul style="list-style-type: none"> <li>• Distribution of faults and fractures</li> </ul>
Cambrian metamorphic rock (Schist, Quartzite)	<ul style="list-style-type: none"> <li>• Distribution of basaltic rocks with faults and fractures</li> <li>• (Distribution of quartz veins)</li> </ul>	<ul style="list-style-type: none"> <li>• Distribution of faults and fractures</li> <li>• Distribution of quartz veins</li> </ul>
Dolerite	<ul style="list-style-type: none"> <li>• Distribution of faults and fractures</li> </ul>	<ul style="list-style-type: none"> <li>• Distribution of small faults and fractures</li> </ul>
Birimien (Schist, Quartzite, Greywacke, Conglomerate)	<ul style="list-style-type: none"> <li>• Distribution of basaltic rocks with faults and fractures</li> <li>• (Distribution of quartz veins)</li> </ul>	<ul style="list-style-type: none"> <li>• Distribution of faults and fractures</li> <li>• Distribution of quartz veins</li> </ul>
Cipolins		<ul style="list-style-type: none"> <li>• Distribution of faults and fractures</li> </ul>
Basaltic rocks	<ul style="list-style-type: none"> <li>• Distribution of faults and fractures</li> </ul>	<ul style="list-style-type: none"> <li>• Distribution of small faults and fractures</li> </ul>
Andesitic rocks		<ul style="list-style-type: none"> <li>• Distribution of faults and fractures</li> </ul>
Amphibolite		<ul style="list-style-type: none"> <li>• Distribution of faults and fractures</li> </ul>
Granitic Rocks (excluding the syntectogenic)		<ul style="list-style-type: none"> <li>• Distribution of faults and fractures</li> <li>• Distribution of quartz veins</li> <li>• Distribution of pegmatite veins</li> </ul>
Granitic Rocks (Syntectogenic)	<ul style="list-style-type: none"> <li>• Deep weathering in coarse granite</li> <li>• Distribution of dikes in coarse granite</li> <li>• Distribution of basic rocks with faults and fractures</li> </ul>	<ul style="list-style-type: none"> <li>• Distribution of faults and fractures</li> <li>• Distribution of quartz veins</li> <li>• Distribution of pegmatite veins</li> </ul>

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## Sanitation

### 4.7 Summary of Sanitation Master Plan

#### 4.7.1 Scope of Sanitation Master Plan

In this Master Plan, it was decided to establish a policy to improve the access rate to improved individual sanitation facilities as part of the sanitation project package for rural areas as recommended in the PEPAM framework.

In PEPAM, the technical options for improved water supply facilities and sanitation facilities were categorized as shown below. The rate of access to sanitation facilities was defined using the number of residents who will have access to “improved sanitation facilities” shown in Table 4-7-1 below.

Table 4-7-1 Classification of improved and unimproved water supply facilities and sanitation facilities<sup>1</sup>

	Improved facilities	Unimproved facilities
Water supply system	<ul style="list-style-type: none"> <li>• Water supply to individual households through house connections</li> <li>• Public water faucets</li> <li>• Deep wells with handpumps</li> <li>• Protected (improved) shallow wells</li> <li>• Protected springs</li> <li>• Rainwater harvesters</li> </ul>	<ul style="list-style-type: none"> <li>• Unprotected shallow wells</li> <li>• Unprotected springs</li> <li>• Purchase from water vendors</li> <li>• Bottled water (unprotected and unprocessed)*</li> <li>• Unprocessed water supplied directly from water tankers</li> </ul>
Sanitation facilities	<ul style="list-style-type: none"> <li>• Sewerage pipelines connected to public sewerage lines</li> <li>• Wastewater treatment facilities connected to septic tanks</li> <li>• Flush toilets</li> <li>• Dry system toilets</li> <li>• VIP toilets with ventilation</li> </ul>	<ul style="list-style-type: none"> <li>• Human waste tub toilets**</li> <li>• Unprotected open pit toilets</li> <li>• Public lavatories using the above systems</li> </ul>

\* Categorized as unimproved facilities because of poor quality and insufficient quantity.

\*\* Human waste is collected in tubs or buckets and thrown away by manual labor.

In addition, in this project, the specifications of the improved sanitation facilities were categorized as shown in Table 4-7-2 below.<sup>2</sup>

Table 4-7-2 Specifications of sanitation facilities in PEPAM

1. Urban public sanitation facilities (Assainissement Collectif) Sewerage pipeline is connected to each household. Composed of a pipeline to dispose wastewater, removal facilities and water purification facilities.
2. Individual sanitation facilities (Assainissement autonom/sur site) i. Household sanitation facilities (Assainissement Individuel) Household toilets and rainwater/wastewater treatment facilities <ul style="list-style-type: none"> <li>• Desirable facilities for urban household sanitation: Combination-type septic tanks, toilets with ventilated decomposition tanks or flush toilets, wastewater treatment facilities connected to septic tanks, combined wastewater treatment facilities connected to decomposition tanks</li> </ul>

<sup>1</sup>Source: "Elaboration d'un document de stratégie pour la réalisation à l'horizon 2015 des objectifs du millénaire pour le développement, Volume 1: ETAT DES LIEUX Rapport définitive," p46; Translated into Japanese then into English by the survey team.

Obtained in October 2008 and used as a source for the Progress Report 2. In the new version, translation was performed again in order to make changes in word usage. (In the previous version, "traditionnelle (traditional)" was used but the word was changed to "non-amélioré (unimproved)" or "Non protégé (unprotected)" and also notes were added.)

<sup>2</sup>Source: "Elaboration d'un document de stratégie pour la réalisation à l'horizon 2015 des objectifs du millénaire pour le développement, Volume 1: ETAT DES LIEUX Rapport définitive"

<ul style="list-style-type: none"> <li>• Desirable facilities for rural household sanitation: Improved ventilated toilets or flush toilets, or promotion of wastewater treatment facilities (decomposition tanks/septic tanks)</li> </ul>
ii. Public sanitation facilities (Assainissement des zones publiques) Toilets in public areas where there is a large volume of human traffic (markets, hospitals, schools, religious institutions, roadside stations, etc.) and rainwater/wastewater treatment facilities
3. Autonomous public sanitation facilities (Assainissement Semi-Collectif) These are facilities to collect both human waste and domestic wastewater for treatment using small-scale treatment facilities such as a small-diameter underground pipelines and decomposition tanks or septic tanks. These facilities are conditional on autonomous operation by their owners (community or village).

#### 4.7.2 Targeted Goals

This rural sanitation master plan applies the study's basic policy so that consideration on rural sanitation programme implementation always accompanies with water supply project. And this principle makes contents of the project established in this Master Plan are divided in to three phase as short term (2010-2015), middle term(2016-2021), and long term (2022-2027) as well as the goals are defined uniformly for the 3 phases as shown in Table 4-7-3 below. In this sanitation development component of Master Plan, those three regions treated as the same condition and applied 3.7% of annual increase rate in whole target area.

Table 4-7-3 Goals for sanitary environment improvement in target areas

Period Region	Target year 2015 Short term	Target year 2021 Middle term	Target year 2027 Long term
National level	63%	81%	91%
Tambacounda	60%	80%	90%
Kédougou	55%	77%	88%
Matam	56%	78%	89%

source : PEPAM-UC/DAR/JICA

#### 4.7.3 Contents of Sanitation Master Plan

The proposed sanitation master plan is composed of three elements: 1) construction of sanitation facilities; 2) proper application of the sanitation concept and health and sanitation knowledge; and 3) establishment of a sustainable operation system in the village. The entire system will be called the rural sanitation system and plans will be made combining the following components.

The minimum unit applied in this planning process is the village.

Table 4-7-4 Components of rural sanitation system

<b>Component 1</b>	Construction of household/public sanitation facilities
<b>Component 2</b>	Activities to identify local resources (human, budget, existing approach, natural resource...)
<b>Component 3</b>	Activities to improve capabilities of human resources Development (training) of rural sanitation education staff (mainly women <sup>3</sup> ) Development (training) of technician and staff of ASUFOR or CBO related to amelioration of sanitation condition in villages
<b>Component 4</b>	Implementation of activities to improve sanitation concept within village
<b>Component 5</b>	Establishment of sustainable implementation system (including monitoring and evaluation)
<b>Component 6</b>	Other activities (to prevent open-air defecation)

<sup>3</sup> In the target area, they are called Relais féminin.

Table 4-8-3 Priorities when installing public sanitation facilities

Priority	1 <sup>st</sup> / 2 <sup>nd</sup> (same priority)	1 <sup>st</sup> / 2 <sup>nd</sup> (same priority)	3rd	4th
Location	Schools	Schools	Religious institutions	Public spaces
Specifications for installation	2 facilities per location, 1 each for men and women		1 per location	Villages with more than 500 villagers 1 each for men and women per village

In previous projects that have been implemented under the PEPAM framework so far, it was recommended to construct public toilets at markets and roadside stations for use by the general public coming from outside the village. It is reported, however, that in many cases the constructed toilets are left unattended, poorly cleaned and carelessly used and the maintenance issue remains unsolved. In this Master Plan, however, it is planned to develop sanitation facilities at important public institutions in the village where the users can be identified to a certain extent in order to improve the effectiveness of the project. Also, in setting the priorities, the policy will be to select the target institutions by confirming that there are both users and maintenance staff on a daily basis. When it is determined to proceed with this project, if there are any poor households in the village that are unable to install a household toilet, a review will be conducted on installation of toilets in public space in the village as shown in the above column for the 4th priority.

#### 4.8.3 Sanitation Project to be Implemented Independently

If any sanitation facilities development project is implemented independently (in which all or part of the construction costs are provided), the target villages will be selected according to the above flow so that sanitary habits can be established in the villages and sustainable operation of the facilities can be ensured comparable to the input.

Although the project will be implemented village by village, it should be the policy to review the project over a wider scope to obtain synergy between villages, for example, by combining neighboring villages that belong to the same CR or villages with the same social and cultural backgrounds as well as aggregating areas under the charge of one ASUFOR for the water supply into one greater area. Also, it should be the policy to establish a monitoring system so that the local administrative bodies and DAR can see how the access rate is improved.

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## **Chapter 7 Operation and Maintenance Plan**

### **7.1 Consignment of Maintenance to Private Sector**

#### **7.1.1 Policy on Consignment of Maintenance to Private Sector**

According to the sector policy document of 2005 (Lettre de politique sectorielle de l'hydraulique et de l'assainissement en milieu urbain et rural, June 2005), which was agreed by 4 Ministries, the maintenance activities were officially noted to be consigned to a private sector by DEM. The plan for structural reform of DEM after the consignment has been already established (though the report has not been disclosed yet). However, the capacity for execution of maintenance activities by the private companies has been questioned in the central area of Senegal, where the consignment to private sector was planned to be commenced earlier than the other areas of Senegal, resulting in a situation where no company was selected for the consignment.

In the target area, there are comparatively worse conditions than the central area, such as aging facilities, delay of establishment of ASUFORs, low density of facilities, and absence of private companies capable of maintenance consignment within the target area, and therefore, it is hard to realize the consignment. Without implementation of any projects in the future to overcome these challenges, the difference between the central and the target area shall be more obvious.

#### **7.1.2 Promotion Period for Consignment of Maintenance Activities to Private Sector**

Promotion of consignment to the private sector in Senegal is supposed to be commenced from the central area of Senegal. It is desirable to implement the consignment to the private sector in the target area using model cases or lessons learnt in the central area. Therefore, promotion of the consignment to the private sector will be described in the mid-term plan (2016-2021).

On the other hand, in comparison with the preceded areas, the target area suffers from such situations as, 1) delay of transition into ASUFOR, and 2) breakdowns and severe deteriorations of most facilities. Therefore, conditions of the consignment to the private sector (rehabilitation of facilities, exchange of equipments, establishment of ASUFORs, and installation of meters for metered billing) shall be prepared as much as possible during the period of the short term plan.

#### **7.1.3 Project Plan**

##### **(1) Preparation Stage (Short Term Plan 2011 - 2015)**

As a preparation stage for promotion of the consignment to the private sector, such activities are planned as, 1) transition of the water management committees into ASUFORs, and 2) resolution of issues of facilities rehabilitation before 2015.

##### **(2) Implementation Stage (Mid-term Plan 2016 - 2022)**

There is no plan for financing except for an expression of support to private sector consignment by BAD. Therefore, DHR and DEM shall raise funds in order to promote the following activities.

- Formulation of the Terms of Reference (TOR) for the consignment to the private sector, and selection of the target villages
- Supervisory works of the tender for the consignment to the private sector
- Resolution of the issues of the contract (rehabilitation of facilities, exchange of equipments and establishment of ASUFORs)
- Support of SM/BPF for strengthening its supervisory works of consignment to the private sector
- Monitoring of the consignment to the private sector for a year after commencement

The above activities are the standard works for promoting the consignment to the private sector.



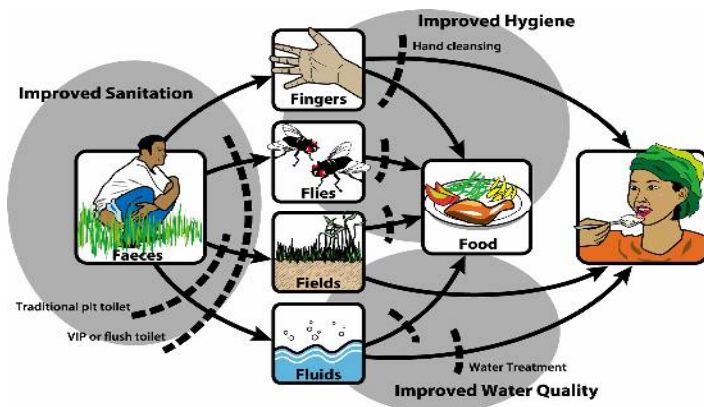


Figure on the left shows the contamination route of oral-fecal diseases that are transmitted by oral route; it also shows the related prevented measures along with the water, hygiene and environment relation.

Legend  
 Black lines: contamination routes  
 Dotted lines: Barrier against contamination by diseases  
 Grey Zones: Scope of the contamination barrier

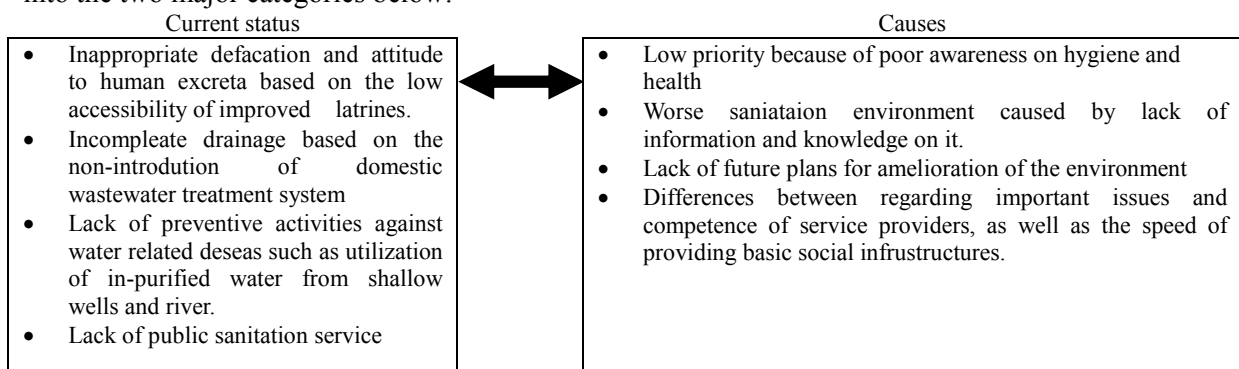
Figure 8-1-1 Fi-diagram and relations between water, sanitation facilities and health notions<sup>2</sup>

Water supply development projects and sanitation facilities development projects are two key mainstays to promote living conditions’ improvement in rural villages. In this present master plan, the four measures above mentioned will be applied in order to overcome the issues in the project’s target regions.

### 8.2 Issues relating to the improvement of sanitation conditions

#### (1) Issues

Under the current sanitation status in the target region, the issues to be overcome may be classified into the two major categories below:



#### (2) Step of improvement for the sanitation conditions

Taking into account the above conditions in the target region, a stepwise rank<sup>3</sup> of the sanitation related issues could be shown as follows:

##### First step: Developing the basic hygiene environment

- Definition : Step where it is necessary to keep away the village people everyday life from human and livestock excreta and prevent water borne diseases resulting from inappropriate drainage of wastewater.
- Situation of the target region : Almost the entire target region are on this first step.
- PEPAM Framework : The package is standardized and its implementation is recommended.

##### Second step: Developing the health environment in community area

- Definition : A certain number of households already experiences to deal with some hygiene and sanitation related issues. This Step is aimed at avoiding water sources pollution caused by the

<sup>2</sup>Source : Developed by the survey team referring to a revision of the Windbland U. & Daddly Diagram, 1997

<sup>3</sup>The related concepts for the establishment of a health environment and improvement of the living environment are often depicted by the image of a staircase that one has to go up step by step (health scale). On the basis of those concepts, it was intended to undertake a stepwise classification of the current situation in order to catch it up in this step of the Master plan.

environmental degradation, such as inappropriate treatment of the various types of waste water, rainwater, domestic wastewater and filthy water also by disposed waste in the villages and in the entire community, in order to prevent an outburst and formation of microbe nests as well as pathogens.

- Status of the target region : A certain number of villages are on this step.
- PEPAM Framework : Along with household level measures, community level measures are recommended for rain water drainage in the area and for improving the health environment. Even if the facilities are defined as public sanitation facilities, the criteria relating to the required capacities and nature for those applying services providers are not clearly defined yet.

**Third step: Developing environment improvement in the area**

Definition : In this step a comprehensive and more advance development of public sanitation facilities, as compared to the above two steps is necessary. At the village level some disparities are observed ; a few of wealthier people have latrines or septic tanks for wastewater drainage and this situation is one cause to verify the measures to be taken inside one village. In this step we need to another study for sewage connection with septic tanks and wastewater treatment facilities (including ditch deposits) and large waste treatment plants that may possibly operated in the target region.

- Situation of the target region: These are very few, those grand villages that might become Rural Community County towns<sup>4</sup> are on this step.
- PEPAM Framework: Situation on this step has been beyond the category of rural sanitation development. However, the consideration on the development for semi-urban public sanitation service is urgently necessary.

In the three target regions, most of sites still remain at the first step where it is still necessary to develop basic health environment. However, the communes, commercial hub, transportation hub along the national road, or grand villages along with the Senegal River (more than 5000 population) are on the third steps.

**8.3 Basic Rural Sanitation Plan**

**8.3.1 Designing the basic rural sanitation plan**

In order to sustainably improve the living condition in the villages, the related orientations for the sanitation development projects (introducing sanitation systems) will be planned reflecting the mutual relation between water, sanitation and health.

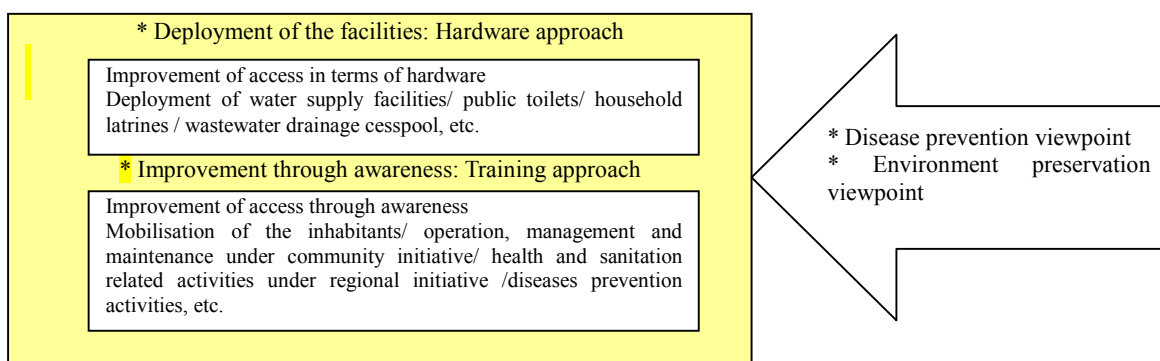


Figure 8-3-1 Conceptual Scheme of sustainable environment preservation

The issues to be considered during the study on the orientations are as follows:

- To increase the number of household latrines, it is indispensable to promote a health and hygiene notions and willingness to improve the environment trough building their ownership of the facilities. The Rural Sanitation Department (DAR) also initiated an approach called as

<sup>4</sup> Rural Community county town

Community-Lead Total Sanitation (CLTS) that particularly stresses the importance of enhancing hygiene notions; in particular the awareness on oral-faeces transmitted diseases in order to keep away the villages from excreta. The study on the introduction of such activities is shown herein in section 8.3.4 (4) in Chapter 8 of Main Report.

- To promote a comprehensive hygiene and health education at the village and regional levels, it is desirable to provide with training the community based extension worker (relais) that are the main executing agents of health education activities within the village, and support village level health education activities as well as to train the technicians (masons)<sup>5</sup> who construct the facilities; and on the other hand, combining creation of the system with promoting community participation is indispensable.
- Providing support the Communaute Rurals (CR) that are responsible for establishing Local Water supply and sanitation plans (PLHA<sup>6</sup>), in order to improve information management functions withinis also necessary.
- In order to correctly use, properly manage and maintain the sanitation facilities, village population (users) will be required to bear about 10%<sup>7</sup> of the latrines construction costs. Moreover, it will be difficult for the most disadvantaged village people to afford those 10%, so we propose the establishment of a micro-credit system using the funds or savings of the community based organization (CBO) such as the ASUFOR.

### 8.3.2 Measures taken in the Master Plan towards sanitation facilities

The status of public and household sanitation facilities deployment, are shown below along with the measures proposed in the present project.

Table 8-3-1 Current status of public sanitation facilities and measures proposed by this project

Specifications	Proposed number of facilities	Measures suggested by the present project
VIP latrines with open ditch	About 90%	Confirming the lapse of time since construction and establishment of a management and maintenance system is indispensable. [Issues to be considered] The existing latrines in schools and health centers in the target region are mostly open ditch VIP latrines. Consequently, in most case the lifespan of the latrines is limited to the capacity of the ditch. We already experienced overflow in some areas and it is quite difficult to keep on using it. Moreover latrines are not provided with lavatories. Such situation is observed in most of the sites in the target region. Consequently, we are suggesting constructing new latrines reflecting the level of priority.
VIP latrine with dual ditch	About 10%	
TCM	Very few	

Remark: As for the proportion of household, the baseline survey results conducted in 2009 for the selection of the priority sites and the results of the baseline qualitative survey were added.

Table 8-3-2 Current status of household sanitation facilities and measures proposed by this Project

Specifications	Proposed number of facilities	Measures taken by the present project
Simple traditional hole	about 80%	Does not match with ongoing sanitation facilities standards and are not considered as existing facilities. Construction of new facilities. [Issues to be considered] Consider that if it may be used continuously until the completion of the facilities, these need to be filled up and not used anymore.
Simple hole fitted with a slab	About 20%	Necessary to check by eyes if it meets the standards. [Issues to be considered] If people keep on using it, raise people's awareness on that fact that it is the lowest health and promote plans for constructing new improved latrines (VIP latrines).

<sup>5</sup> In Senegal masons, refer to standalone sanitation facilities construction technicians.

<sup>6</sup> Local Water Supply and Sanitation Plan: PLHA, established within the RC with the support of the World Bank. (See section 2.2.2 of Chapter 2)

<sup>7</sup> In the household survey results (qualitative survey), 100% of the household expressed their willingness to pay for the cost. On the other hand, if the number of households that agreed to give cash contribution still remains low, most household responded that they could afford about 10% of the costs by providing their labor force or locally available materials.

VIP and DLV	Very few	Give directions on a methodology for an appropriate use, management and maintenance.
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Remark: as for the proportion of households, the baseline survey results conducted in 2009 for the selection of the priority sites and the results of the baseline qualitative survey were added.

### 8.3.3 Project implementation units

According to the survey results, the smallest target unit for the implementation of the master plan will be a village.

Study was conducted to try establishing master plan with the wide scale as based on the village groupe like water supply master plan. However in target region, while considering that differences could not be observed in the mutual relations between the administrative units such as the regions, the departments and the districts, etc.; and the population size among others. It was difficult to specify the parameters enabling making up some large-scale groups. Consequently, the smallest unit in this present master plan will be a village.

### 8.3.4 Reviewing the Sanitation Master Plan

The sanitation systems include the following three constituents, namely 1) the construction of sanitary facilities, 2) an appropriate application of hygiene notions and health and sanitation related knowledge; and 3) a sustainable implementation system within the villages. It is made of the below six components:

- Component 1 : Construction of household and public sanitation facilities
- Component 2 : Activities to identify local resources (human, budget, existing approach, natural resource...)
- Component 3 : Activities to improve capabilities of human resources
  - Development (training) of rural sanitation education staff (mainly women )
  - Development (training) of technician and staff of ASUFOR or CBO related to amelioration of sanitation condition in villages
- Component 4 : Implementation of activities to improve sanitation concept within village
- Component 5 : Establishment of a sustainable implementation system (including supervision and evaluation)
- Component 6 : Other activities (to prevent open-air defecation)

The study on the content was conducted in line with the results of the study on the sanitation system's components, on the PEPAM monitoring indicator<sup>8</sup> and on the relaxing of the PEPAM specifications already mention in section 2.2.5 in Chapter 2 of Main Report.

#### (1) Scope of the plan

The scope of the Master Plan will be same as that of the rural sanitation system (onsite saniataion) .

#### (2) Selecting the target regions for the introduction of the sanitation facilities

For the installation of the sanitation facilities, priority is given to the regions where daily water supply is possible. It is aimed to ensure that an improved sanitary environment will be established in the villages through the sanitation facilities development project and by achieving synergy with the water supply facilities development program. But the water utilized to improve sanitation condition and behaviour change on hygiene and sanitation, it is not necessary to controle water quality as same way as drinking water, also it is essential that the villagers that are forced to use the water from shallow well (puits) or river, need to get knowledge and do appropriate practice concening health and hygiene. So, the selection of the target site shall be taken into consideration for the villages where usually get

<sup>8</sup> Supporting the establishment of system for the monitoring of the Millennium Drinking water supply and sanitation program, Report No2 ; Definition of the final version of the PEPAM monitoring indicators, September 2006,