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Managing Water for African Cities

**Dakar City**

**Implementation Plan**

Environmental Component

**Appraisal Report**



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<p><b>Abstract</b></p> <p>This is an appraisal of the environmental component of the Dakar City Implementation Plan under the Habitat guided programme "Managing Water for African Cities". The objective of this appraisal was to ensure the conformity of the plan with the objectives of the Regional Project and Senegal's needs and to explore the availability of domestic resources (human, institutional, and financial) required for efficient project implementation. The appraisal recommends that the design of the city implementation plan should include an inception process involving Senegalese partner institutions and stakeholders, since Senegalese ownership to the plan is essential to its successful implementation. It is proposed that the city plan should take a step-wise and action oriented approach. It should start with the community based wastewater management component to demonstrate results on the ground in the selected urban communities. An immediate action will be to establish the environmental task team and appoint a task leader who will act as the main driving force in the City Plan implementation process.</p>
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Managing Water for African Cities

**Dakar City Implementation Plan**

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## Preface

The Cape Town declaration adopted by African Ministers in 1997 recognises that increasing population and rapid urbanisation in Africa pose a serious threat of depletion, pollution and degradation of freshwater supplies, especially in the high-density areas. Since the cities are important driving forces in the political and socio-economic development, special emphasis is needed for the protection and management of local water resources and catchment areas, and equitable sharing of water between urban needs. The “Managing Water for African Cities” is implemented and promoted jointly by Habitat and UNEP within the framework of the United Nations Systems-wide Initiative for Africa and is responding directly to the Cape Town Declaration. The aim of the project is to promote integrated urban water resource management and building capacity in key local and regional institutions paying attention to the links between water, urban development and the environment in seven selected cities. These are Abidjan, Accra, Addis Ababa, Dakar, Johannesburg, Lusaka, and Nairobi. These cities have prepared individual City Implementation Plans addressing effective water demand management (WDM) and actions to mitigate the environmental impact of urbanisation on freshwater resources and aquatic systems. The environmental components of these plans are being reviewed with the aim to assist the cities in pursuing the implementation of the city plans. The City Implementation Plan for Dakar has been reviewed by the undersigned in close collaboration with the concerned Zambian partner institutions and Dr. Graham Alabaster, Human Settlement Officer of Habitat Nairobi. I would like to express my thanks to all people met for their kind support and valuable contributions during the review mission. This Appraisal Report highlights some key issues and recommendations on how the city plan process should proceed. The report solely reflects the views of the undersigned, which do not necessarily correspond to either those of the Government of Zambia or those of HABITAT or other institutions mentioned herein.

Oslo, 31 January, 2000

*Torbjørn Damhaug*

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**Abbreviations**

CONSERE	Conseil Supérieur de l'Environnement et des Ressources Naturelles (National Council of Environment and Natural Resources)
CSE	Conseil Supérieur de l'Eau (National Council of Water)
CSIE	Cellule de Suivi des Impacts Environnementaux (Environmental Impact Monitoring Unit) of the PSE
ENDA-TW	Environment and Development in the Third World
ESA	External Support Agency
IBRD	International Bank for Reconstruction and Development ("World Bank Group")
LFA	Logical Framework Approach
LTWSP	Senegal Long Term Water Sector Project
MH	Ministère d'Hydraulique (Ministry of Hydraulics)
NIVA	Norwegian Institute for Water Research
ONAS	Office National de l'assainissement (National Sewage Department)
PAD	Project Appraisal Document
PADE	Processus d'amélioration durable de l'environnement
PSE	Projet Sectoriel Eau (Water Sector Project)
SDE	Sénégalaise des eaux (Senegal Water Company)
SGPRE	Service de Gestion et de Planification des Ressources en Eau (Water Resources Management and Planning Agency)
SONES	Société National des Eaux du Sénégal (National Water Sector Holding Company of Senegal)
UNCHS	United Nations Centre for Human Settlements (HABITAT)
WRM	Water Resources Management
WSP	Water Sector Project
WSS	Water Supply and Sanitation

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## Summary

The Government of Senegal (Ministry of Water) and UNCHS/HABITAT have signed a Memorandum of Understanding as part of the project “Managing Water for African Cities”. This report is an appraisal of the environmental component of the Dakar City Implementation Plan as it appears in the Memorandum of Understanding.

The Dakar City Plan has a great advantage of being part of the IBRD supported water sector projects in Senegal. Some elements of the Plan are already mentioned in the Project Appraisal Document of the Long Term Water Sector Project. Nevertheless, the appraisal mission observed that the environmental component of the City Plan is still in a premature stage of preparation, hence this appraisal report has more the character of providing input and recommendations for the next preparatory steps than a typical review document.

The overall objective of the environmental part of the City Implementation Plan of HABITAT is to mitigate the environmental impacts of urbanisation on freshwater resources and aquatic ecosystems, to improve the health of the communities, and prevent deterioration of water resources and the environment. In response to this objective, the existing environmental component of the City Implementation Plan sets out to demonstrate the feasibility of substituting the use of precious groundwater from the city aquifers by reuse of treated wastewater effluents from the Cambérène sewage treatment plant. It is intended to use the treated wastewater for irrigation of the nearby golf course and/or the timber/firewood production scheme. However, the Cambérène plant is in a poor state of repair and the planned rehabilitation may prohibit a prompt start-up of the reuse scheme. Hence, before adopting the Cambérène option the mission recommends considering alternative community-based options to the management and reuse of treated wastewater in urban areas, such as in Rufisque, as already suggested in the Project Appraisal document of the Long Term Water Sector Project.

As part of the water sector projects, Senegal is developing a highly competent and capable institutional structure for integrated water resources management and sanitation development at national and local levels. The identified cornerstone institutions of the environmental component of the City Plan are (i) SGPRES on water resources management; (ii) ONAS and ENDA on urban/peri-urban sanitation development; and (iii) the Environmental Impact Monitoring Unit of the PSE on environmental issues. Even if the review confirmed that the required local capacity for efficient implementation of the Plan is in place, it is obvious that the organisation and management of the environmental component as well as the appointment of a task leader need to be firmed up soon.

The appraisal report presents a tentative implementation schedule with a four years project period. An immediate action should be to establish the environmental task team and appoint a task leader. The appraisal mission recommends the Plan being reinforced through a participatory inception exercise to agree upon its objectives, scope, schedules and budgets. The inception activities should be guided by the Logical Framework Approach (LFA) and managed by the Senegalese environmental task team with some external support if needed.

The mission’s recommendations were presented in the wrap-up meeting with the Co-ordinator and the relevant key institutions. It is recommended to start the first phase with a community-based sanitation and wastewater management component as the in first phase of the Plan, followed by the Cambérène effluent reuse component as the subsequent stage in conjunction with the rehabilitation of the treatment plant.

# 1. INTRODUCTION

This report is a summary of findings and recommendations from an appraisal mission to Dakar, Senegal from November 21 to 27 1999. The appraisal was carried out by Torbjørn Damhaug, Technical Advisor from the Norwegian Institute for Water Research (NIVA) Oslo in co-operation with Graham Alabaster of HABITAT Nairobi. The mission met with a number of representatives of relevant authorities, institutions, external support agencies and other stakeholders as shown in Appendix A. A similar review of the Lusaka City Implementation Plan was carried out from October 28 to November 4, 1999. These appraisal reports will serve as an input to for the forthcoming city consultations to be organised by HABITAT.

## 1.1 Managing Water for African Cities

This review is carried out under the auspices of the initiative “Managing Water for African Cities” (the Project). The Project is implemented and promoted jointly by HABITAT and UNEP within the framework of the United Nations Systems-wide Initiative for Africa, and responds directly to the Cape Town Declaration<sup>1</sup> (1997) adopted by African Ministers.

The aim of the Project is to promote integrated urban water resource management and building capacity in key local and regional institutions paying attention to the links between water, urban development and the environment in seven selected cities. These are Abidjan, Accra, Addis Ababa, Dakar, Johannesburg, Lusaka, and Nairobi. The objectives of the Project are to:

- promote integrated approaches to managing urban water resources,
- improve efficiency of water use in urban areas
- improve knowledge base of the impact of urbanisation on freshwater resources
- improve exchange of information and good practices on water resources management for urban areas

The Project includes the preparation of individual city implementation plans addressing the following inter-connected components:

1. Develop an effective water demand management (WDM) strategy for efficient water by the consumers and in African Cities
2. Mitigate the environmental impact of urbanisation on freshwater resources and aquatic systems by:
  - setting up early warning mechanisms for timely detection of “hot spots” where sustainability is likely to be threatened
  - assessment of long-term environmental impacts of large cities on the continent’s water resources

The city implementation plans as stated in the Project Implementation Strategy<sup>2</sup> and the associated Implementation Strategy for the Environmental Component<sup>3</sup> is claimed to be the first comprehensive

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<sup>1</sup> UNCHS (HABITAT) Partnership in the Water Sector for Cities in Africa. Report on the Cape Town Consultations 8-10 December 1997.

<sup>2</sup> UNCHS (HABITAT) and UNEP: Managing Water for African Cities: Volume 1: Project Implementation Strategy. Expert Group Meeting Cape Town, South Africa, 26-28 April 1999.



initiative to support local and national governments and their partners to effectively cope with the growing urban water crisis and related environmental impacts.

## **1.2 The Environmental Component of the Dakar City Implementation Plan**

### **1.2.1 Objectives**

The HABITAT mission report<sup>4</sup> of June 1999 recommends a number of issues to be addressed by the Dakar City Plan. These issues served as an input to the Memorandum of Understanding between the Government of Senegal and the HABITAT<sup>5</sup>. According to the project documents the environmental part of the Plan will primarily focus on reuse of sewage effluents in order to “reduce the effects of pollution of water resources”. It is therefore understood that the purpose of this component would be to substitute the use of precious groundwater from the city aquifers by the reuse of treated wastewater and to demonstrate the feasibility of this option.

### **1.2.2 Institutional framework**

The national focal institution for the Dakar City Implementation Plan is the Ministry of Water (MH) who will be responsible for co-ordinating in-country activities and ensure participation of various stakeholders including participation in the project steering committees. Other key partner institutions are the National Water Sector Holding Company of Senegal (SONES), the National Sewage Department (ONAS), the Water Resources Management and Planning Agency (SGPRE), and the Senegal Water Company (SDE). It has been established that the MH's co-ordinator of the Water Sector Project and the Long Term Water Sector Project also will co-ordinate the implementation of the Dakar City Plan. The appraisal mission proposes that the environmental component be jointly co-ordinated the ONAS and the SGPRE (Figure 1). The institutional arrangement for the community-based demonstration project is proposed in Figure 3 of chapter 3.

### **1.2.3 Status of the planning process**

The City Plan will include pilot projects within the context of the ongoing Senegal Water Sector Project and the planned Long Term Water Supply Project. The latter is envisaged to be appraised in February 2000 the preparation of the Plan has to be part of this process. Not much progress has been made on the environmental component since the signing of the Memorandum of Understanding in January 1999. Since the environmental component of the City Plan is still under preparation, this appraisal has more the character of input to the planning process in collaboration with the key actors than that of a traditional review. This will require the City Plan documents being further refined and completed through follow-up deliberations jointly between the key institutions involved.

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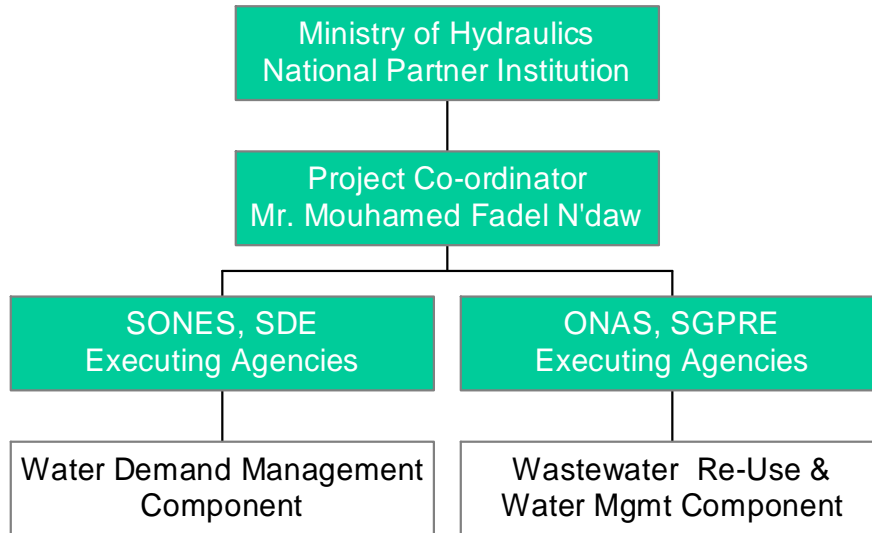
<sup>3</sup> Managing Water for African Cities: Project Implementation Strategy - Mitigating the Impact of Urbanisation on Freshwater Resources.

<sup>4</sup> Managing Water for African Cities – Report on Mission to Dakar, Senegal by Saul Arlosoroff (12/6/99 – 19/6/99)

<sup>5</sup> Memorandum of Understanding between the Ministry of Hydraulics, Government of Senegal and UNCHS (HABITAT) concerning collaboration on project “Managing Water for African Cities” (11 January 1999)

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**Figure 1.** Dakar City Implementation Plan – Institutional Framework



#### 1.2.4 Appraisal approach

The terms of reference for this external review of the environmental component of the Dakar City Implementation Plan call for the following responsibilities of the Technical Adviser:

- assist in appraising the city implementation plan in the area of environmental assessment/pollution control to ensure broad conformity with the objectives of the Project: “Managing Water for African Cities” and compliance with Senegal’s priorities and needs
- initially assess the available institutional and human resources capacity required for efficient project implementation

The review of the environmental component of the Plan involved consultations with all relevant actors and stakeholders in Dakar to assess gaps and/or shortcomings and recommendations on improving the Plan and necessary immediate and long-term follow-up actions.

## **2. REVIEW OF THE DAKAR CITY IMPLEMENTATION PLAN**

### **2.1 Policy and Objectives**

#### **2.1.1 The planned interventions partly respond to the objectives of the Water for African Cities**

The environmental component of the Plan primarily focuses on reuse of sewage effluents for watering the golf course and the timber/firewood production in the vicinity of the Cambérène treatment plant. Reuse of treated effluents as a mean to relieve the pressure on scarce freshwater resources is basically in agreement with the objectives of the Project “Managing Water for African Cities”. Nevertheless, before adopting this relatively confined approach, it is recommended to consider alternative options to the management and reuse of treated wastewater in Dakar. The latter should also take into consideration the overall Project objective of mitigating the environmental impacts of urbanisation on freshwater resources and aquatic ecosystems to improve the health of the communities.

#### **2.1.2 The Plan is in agreement with Senegal’s priorities**

The concept of the City Implementation Plan corresponds well with the ultimate goal of the Government’s policy to reduce the incidence of poverty and improve the well being of the Senegalese people. Increasing access to safe water supply and sanitation services is stated in the water sector projects as a vital factor to improve the health of the population. The Dakar City Implementation Plan is in agreement with the Government strategy to resolve the serious deficiencies of water and sanitation services in peri-urban areas and informal settlements as a priority issue.

#### **2.1.3 Senegalese commitment is in place but co-ordinated actions are needed**

The success of the Dakar City initiative heavily depends on Senegal’s commitment to and ownership of the agreed Implementation Plan. The mission noticed that all the key actors (MH, SONES, ONAS, and SGPRES) expressed their keen interest in seeing the Plan moving forward, and so did the NGO ENDA Tiers-Monde. As suggested in chapter 3, the Senegalese commitment needs to be translated into concerted actions by the key actors of the Plan.

### **2.2 Assessment of Project Design**

#### **2.2.1 Consider optional approaches and sites for the demonstration projects**

The appraisal team explored the opportunities for alternative approaches and sites for the environmental component of the Plan.

##### *Effluents from the Cambérène sewage treatment plant.*

The current environmental component pays special attention to the economic potential in the utilisation of excessive amounts of effluents from the Cambérène sewage treatment plant for watering the nearby golf course and the timber/firewood production scheme (Appendix B). The treatment plant is, however, in a poor state of repair and will be rehabilitated as part of the water sector projects. Hence, the time needed for rehabilitation of the plant may delay the implementation of effluent reuse activity of the Dakar City Plan. Therefore, the mission suggests this activity being considered for implementation under a later stage of the Implementation Plan.

### *Community-based wastewater management in peri-urban areas*

Demonstration of community-based wastewater management in peri-urban areas with piped water supply represents another project opportunity. This involves appropriate sanitation solutions together with options for wastewater treatment and effluent re-use including aquifer recharge. This alternative would benefit from partnership with ongoing community initiatives, such as Project 3 and 4 in Appendix B (ENDA initiatives). Such activities can start relatively soon in agreement with planned projects suitable for complementary activities by the City Plan. Alternative sites for that were visited during the mission included (Appendix C):

- A residential quarter in Rufisque (ongoing ENDA project)
- L'école polytechnique in Thiès (reuse of wastewater for irrigation purposes)
- Railway site in Rufisque (old infiltration site in the hinterland between rural and urban communities)

Other options should also be considered in consultation with ENDA and ONAS.

### **2.2.2 Concentrate in the first place on community-based wastewater management interventions and strategies**

It is important to ensure local participation and partnership in the planning and development of sanitation systems and integrated management of the wastewater in peri-urban settlements. The technical solutions must be affordable and manageable by the communities themselves. Therefore these systems will differ from the city centre and high cost sewerage solutions. It is recommended that the City Plan shares and pursues the strategies of the community-based peri-urban initiatives, such as those of ENDA. The environmental component of the Plan should strengthen the links to the latter.

### **2.2.3 Appreciate the raw water abstraction charge and other groundwater management measures**

Reallocating the current use of groundwater for domestic water supply in the Dakar area towards agriculture (market gardening) and other competing uses remains an issue under the LTWSP. The growing need for water for agriculture and industry in urban areas exceeds the sustainable yields of the aquifers and firmer measures (licensing and pricing) to regulate groundwater abstraction is expected to be introduced. The raw water abstraction fee ("redevance d'exhaure") paid to the MH/SGPRE by private well operators will be revised under the LTWSP and upgraded to become an efficient tool for management and valuing of the groundwater. The above factors should play an important role in the analysis of effluent management opportunities in terms of treatment, re-use and aquifer recharge.

### **2.2.4 The Plan should benefit from the aquifer monitoring system under PSE**

The Plan should set out to develop a strategy for enhanced aquifer management in Dakar to mitigate pollution and over-exploitation of groundwater. In order to monitor possible impacts of groundwater recharge interventions the Plan should take advantage of the aquifer monitoring system of the PSE which is part of the mandatory environmental surveillance arrangement. The SGPRE submitted the first monitoring report in July 1999<sup>6</sup>, which also may serve as a baseline study of the existing condition of the pertinent aquifers. The "Cellule de Suivi des Impacts Environnementaux" (Environmental Impact Monitoring Unit) is assigned the responsibility of supervising the status of the aquifers and other environmental issues of the PSE. The Plan could gain from this unit as a supervisory body for the environmental aspects.

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<sup>6</sup> Republique du Senegal MH/SGPRE. Suivi des nappes sables quaternaires de la presqu'île du Cap Vert et du Littoral Nord. Resultat de la campagne de mesures de juin 1999.

### **2.2.5 Co-operation with associated projects to be formalised**

The Implementation Plan for the Dakar City has great potential of complementing and interacting with ongoing projects. The Demonstration Project is supposed to be based on linkages with other ongoing initiatives in Dakar region with similar objectives, in particular the ENDA initiated projects. In that respect it is necessary to formalise the co-operation with ongoing projects to avoid duplication of efforts in reinforcing the peri-urban wastewater management.

### **2.2.6 Performance monitoring to be addressed**

The performance monitoring and review aspects have not been specifically mentioned in the planning documents. It is advised to address this issue as part of the inception process.

## **2.3 Economic and Financial Aspects**

### **2.3.1 The Long Term Water Sector Project (LTWSP) is hosting the Plan**

The IBRD has agreed that the City Implementation Plan will be a suitable element to be funded by the LTWSP. A separate collaborative arrangement will be developed between the IBRD and HABITAT. The draft Project Appraisal Document (PAD) mentions that the joint Government of Senegal and HABITAT City Plan initiative is an integrated part of the Long Term Project. The relevant components include improved coverage and reliability of water supply and sanitation services in low-income and other urban areas in a demand-based and decentralised manner. Moreover, the LTWSP comprises rehabilitation of sewerage networks, storm water systems, and wastewater treatment plants.

### **2.3.2 Establish a budget for the environmental component of the Plan**

The budget attached to the “Memorandum of Understanding” only indicates the funding contributions from HABITAT. The Plan ought to include a breakdown of the budgetary requirements (structural and non-structural) connected to each activity under the PSE and the LTWSP as well as indicating the local funding contribution. It is recommended to address these issues as part of the inception activities.

## **2.4 Institutional Aspects**

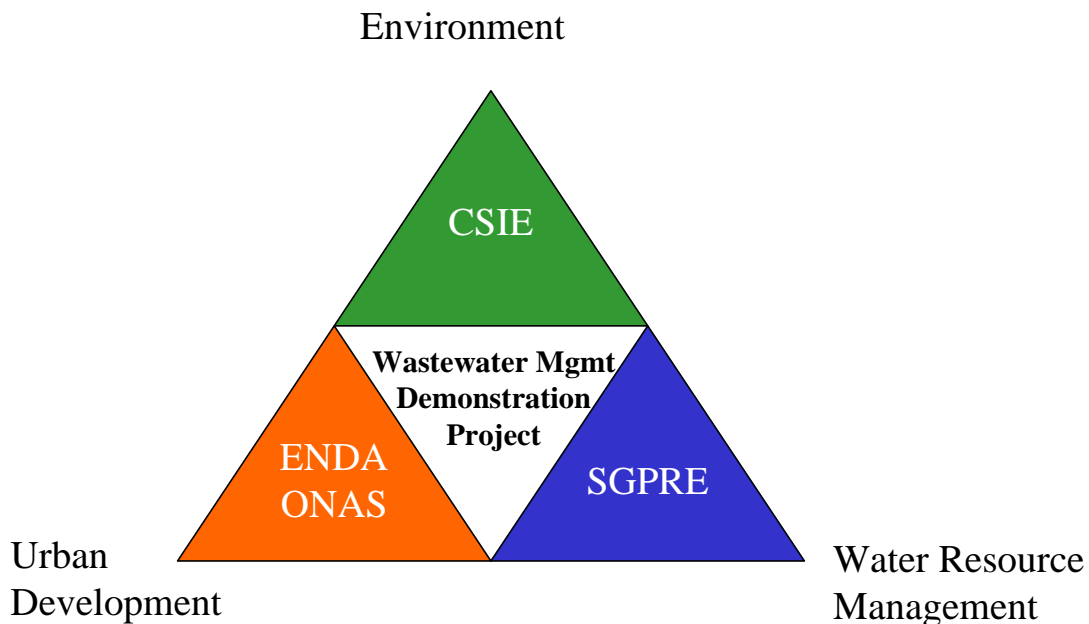
### **2.4.1 Institutional capacity in place but the task team is still not established**

The necessary local capacity for efficient implementation of the Plan appears to be in place, provided the institutions assign some key personnel to the Plan. As part of the water sector projects, Senegal is developing the needed institutional capacity to deal with integrated water resources management and water supply and sanitation development at national and local levels. The mission noticed that for the time being the environmental component of the Dakar City Implementation Plan has not gained the same momentum as the water demand management component. However, key people met were enthusiastic about seeing the environmental component gaining momentum and the relevant institutions becoming more efficiently involved in the Plan. The next section suggests an institutional structure of the environmental component, which has to be settled in connection with the inception process.



Environmental Impact Monitoring Unit of the PSE on environmental dimensions. SGPRE would be the natural WRM partner due to its position as the key water resources authority and its involved in the monitoring programme of Cap Vert and Littoral Nord aquifers under the PSE and LTWSP. SGPRE could contribute with hydrogeological assessments of wastewater management options and do the monitoring of the impacts of the interventions of the demonstration projects. The urban development component of the Plan in terms of provision of sanitation services and effluent treatment should be managed jointly by ONAS and ENDA with the latter acting as the executing body. It is important to secure that the technological solutions and management structures for sanitation development are in accordance with the anticipation and capacity of the pilot communities. In the case of Greater Dakar, the appraisal mission suggests that environmental corner of the triangle be handled by the Cellule de Suivi des Impacts Environnementaux (Environmental Impact Monitoring Unit) of the PSE. This unit is a mandatory part of the PSE/LTWSP and has a broad representation of various authorities and key actors of the PSE and LTWSP. It would therefore be in a favourable position to link the City Plan interventions to the environmental strategies of the water sector projects.

**Figure 3.** Proposed Institutional Structure for the Environmental Component



CSIE:	Cellule de Suivi des Impacts Environnementaux du PSE
ENDA:	Environment and Development in the Third World
ONAS:	Office National de l'assainissement
SGPRE:	Service de Gestion et de Planification des Ressources en Eau

### **3.3 Project Mobilisation and Inception**

The appointment of a task leader is urgently needed since this position will be the key driving force of the environmental component. The terms of reference for the task leader and the roles of the respective key institutions must be prepared by the management of the City Plan as soon as possible. It is also important to be specific about administrative procedures and responsibilities, such as relations to the LTWSP, accounting systems, auditing arrangements, reporting routines, and quality assurance. The task leader will organise the necessary follow-up actions including the inception process.

The assessment suggests that the project design have to be firmed up around a common perception of the objectives, interventions, pilot communities, institutional responsibilities, and performance indicators before launching the implementation of the environmental part of the City Plan. This will require an interactive and dynamic process between the main partners and stakeholders concerned, including NGOs, and community representatives. It is suggested using the structure of the Logical Framework Approach (LFA) as a guiding tool to establish the objectives and activity plans. This is a recognised method among donors and other funding agencies, including the World Bank. This will make the integration of the project into the LTWS support easier. An experienced moderator should facilitate the LFA exercise, with the environmental task playing a leading role. HABITAT should be the main external partner guiding and supporting the inception exercise.

One of the outputs of the inception process would be a draft plan community oriented aquifer management in the Greater Dakar area. Some specific issues that should be addressed during the inception stage include:

- Appoint task leader and project team members from the various institutions;
- Clarify institutional responsibilities and commitment to the environmental component of the Plan;
- Establish collaboration with ENDA;
- Make a rapid assessment of effluent management options and select demonstration sites;
- Verify the World Bank's commitment and financial support to the Plan, and if necessary seek supplementary financial support to the Plan;
- Prepare input to the PAD of the LTWSP;
- Prepare an action plan, including budgets and schedules for the demonstration project of the City Implementation Plan.

### **3.4 Demonstration Project on Community-based Wastewater Management**

This component focuses on demonstration of community-based wastewater management in peri-urban areas with piped water supply. Special emphasis has to be placed on demonstration of appropriate sanitation solutions together with wastewater treatment and options for effluent re-use including recharge of local aquifers. This activity will benefit from partnership with ongoing community initiatives, such as Project 3 and 4 in Appendix B (ENDA initiatives). This activity can start relatively soon as the are ongoing and planned projects that would be suitable for complementary activities under the City Plan. Selection of pilot sites and scoping of this component has to be undertaken as part of the inception activity.

### **3.5 Reuse of Sewage Effluents of the Cambérène Treatment Plant**

This is the original environmental component according to the Memorandum of Understanding. Its key activity is reuse of sewage effluents for watering the golf course and the timber/firewood production in the vicinity of the Cambérène treatment plant, and a fact-finding mission to Israel. The



implementation has to be harmonised with the rehabilitation works of the Cambéréne treatment plant under the LTWSP.

### **3.6 Exchange of Experience and Replication**

The experiences from the City Plan will contribute to the development of good practices for pollution control and wastewater management in existing compounds as well for future extension and improvement of the WSS service coverage, including storm-water drainage and solid waste disposal. This project component will also involve cross-fertilisation among urban areas in Senegal and among other cities involved in the project “Water for African Cities”.

### **3.7 Performance Monitoring and Review**

It is recommended that performance monitoring and reviews shall be regular activities during the implementation of the City Plan. Monitoring entails checking and control of the Plan’s achievements compared to the planned inputs, activities and outputs, using the developed indicators. It is necessary to establish a format for monitoring and reporting that will be used throughout the life of the Implementation Plan. The format should be such that inputs, activities and outputs are monitored with reference to the goals and objectives of the Plan and its sub-components. The factors essential for the sustainability of the Dakar City Implementation Plan comprise (i) policy support measures and local ownership; (ii) institutional aspects; (iii) financial/economic conditions; (iv) technological factors; (v) socio-cultural factors; and (vi) environmental and ecological effects.

## 4. APPENDICES

### Appendix A. People Met

<b>Name</b>	<b>Position</b>	<b>Affiliation</b>
Mr. M. Fadel N'daw	Project Co-ordinator	MH
Mrs. Astou Faye Fall	Director	SGPRE
Mr. Seny Coly	Engineer- Hydrologist	SGPRE
Mr. Matar Fall	Sr. Sanitary Engineer	World Bank Resident Mission
Mr. Oumar Diallo	Director	Contrôle d'Exploitation, SONES
Mr. Jamal Diom	Engineer	SONES/DCE
Mr. Adama Mbaye	Directeur Etudes & Travaux	ONAS
Mr. Malick Gaye	Co-ordinator	ENDA tiers monde
Mr. Amadou Deme	Secretary General	Thiès Municipality
Mr. Imar Diom	Engineer	SONES/DSE
Mr. Eric Moukoru	Support to Dakar & Abidjan	UNDP Volunteer
Mr. Became S. Diop	Researcher	ISE Université de Dakar
Mr. I Dione	Dep. Lab. Manager	Cambérène Sewage Treatment
Mr. Alexandre Repetti	Dipl. Engineer	Ecole Polytechnique Lausanne
Mr. Amadou De	Director	SETICO Consultants
Dr. Graham Alabaster	Human Settlements Officer	HABITAT
Mr. Judo Kaerts	Expert on Water Exploitation	Consultant WDM (from NL)
Mr. Amadou De	Director General	CETICO Consultants

## Appendix B. Overview over Associated Projects

	Title	Host Institution	Partner Institutions	Funding agencies	Approximate Budget US\$	Year
1	Senegal Water Sector Project	MH PCU	SONES ONAS SGPRE	IBRD + +	300 mill	1995 - 2001
2	Senegal Long Term Water Sector Project	MH PCU	SONES ONAS SGPRE	IBRD + +	225 mill	2000 - 2006
3	Le Programme PADE (Processus d'amélioration durable de l'environnement) : Le cas Rufisque		ONAS			
4	Pour une privatisation communautaire des services publics de base dans les villes d'Afrique de l'Ouest					

### Project 1: Senegal Water Sector Project (PSE)

This project involves water sector institutional reforms and critical investments to meet Greater Dakar's water demand for the year 2000 and sets the stage for the Long term Water Sector Project (LTWSP). The objectives of the project are: (i) promotion of sector management, introduction of pricing and cost recovery and reducing the Governments subsidies of water for industrial, domestic and irrigation; (ii) poverty alleviation and public health improvements by increasing access to safe water for the urban poor; (iii) private sector participation; urban and peri-urban sanitation improvement; and (iv) reinforcement of the nation's water resources management capacity. The project allows temporary use of groundwater from the North Coastal and the Cap Vert region aquifers to cover the immediate water demands, provided this exploitation will be phased out and substituted by imported water from Lac de Guiers by the year 2002. It is a condition that the water quality and groundwater level of these aquifers shall be carefully monitored and reported to the "Cellule de Suivi des Impacts Environnementaux" (Environmental Impact Monitoring Unit) of the PSE. This unit should also play a role in the implementation of the Dakar City Plan.

### Project 2: Senegal Long Term Water Sector Project (LTWSP)

This is the "host project" of the Dakar City Implementation Plan, and already mentioned in the Project Appraisal Document (PAD). The development objective of the LTWSP is to achieve sustainable improvements in the provision of water and sanitation services in unserved and low-income areas of Dakar and secondary cities. This objective will be pursued by (i) supporting further institutional and regulatory reforms and policy enhancements in the water sector; and (ii) removing major physical constraints, using private sector project financing. The LTWSP will be consolidating and building on the achievements of the ongoing Water Sector Project (WSP), which will be completed in 2001. As stated in the draft PAD (July 99), the City Plan is applicable to many of the components of the LTWSP, such as improved coverage and reliability of water supply and sanitation services in poor urban communities in a demand-based and decentralised manner including private sector involvement. The LTWSP also comprises rehabilitation and expansion of sewerage networks, storm water drainage, and wastewater treatment plants. The re-use of treated wastewater from the Cambérène treatment works and evaluation of waste stabilisation treatment at Rufisque are mentioned specifically in the urban sanitation component of the PAD.

The WRM component of the LTWSP includes the construction of some 20 small water retention structures ("retenues collinaires") in intermittent rivers in the Greater Dakar area. These multipurpose

systems cover various water requirements, such as cattle watering, small irrigation schemes, and groundwater recharge. It would be of interest to explore the connections between this component of the LTWSP and the City Implementation Plan, since both of them are dealing with alternative uses of “extra” water resources in peri-urban areas.

**Project 3: Process for sustainable environmental improvement – the Rufisque case**

The project is presented in the report from the Cape Town Consultations (1997) as a best practice example. It is part of Project 4 in the above table. The sewerage component is aimed at providing affordable sanitation services to the less privileged peri-urban settlements based on local ownership and locally managed funding mechanisms to secure durability. The pilot project addresses wastewater treatment and effluent reuse options including aquifer recharge. The results so far are predominantly positive and the technical as well as the organisational experiences seem worthwhile to replicate in other urban communities.

**Project 4: Privatisation of public services in urban communities in West Africa – Management of Domestic Wastewater (PADE)**

This ENDA Tiers Monde project follows a community-based approach to the improvement of public services and promotion of sustainable environmental management taking into consideration environmental health issues and economic self-sufficiency. The Senegal operations include pilot projects in the Dakar region (Rufisque, Pikine) and other regions (Thiès, Kaolack, Saint-Louis, and Diourbel). Project 3 is part of this programme.

## Appendix C. Visits to potential sites for demonstration projects

### Cambérène Sewage Treatment Plant

**Figure 4.** Grid chamber of Cambérène Sewage Treatment Plan



The Cambérène treatment plant only receives about 10% (93,000 m<sup>3</sup>/d) of the water used in Dakar. The treatment plant is in a poor state of repair and is now functioning as an aerated retention system for wastewater before it is discharged into the sea and partially seeps into the soil or evaporates.

### A residential quarter in Rufisque

**Figure 5.** Overhead tank in Rufisque



The residential quarter for the pilot project comprises some 185 households. The pilot community is equipped with small-bore sewerage collection system, treatment lagoons and various options for reuse of wastewater such as on-site and off-site irrigation, infiltration into the groundwater etc. To secure sustainable maintenance and operations, the system is operated by a local micro-enterprise



### L'école polytechnique in Thiès

**Figure 6.** Holding basin for sewage from l'école polytechnique in Thiès



Thiès is an area of rapid urbanisation without sufficient planning and regulation. It is necessary to strengthen the co-operation between urban and rural authorities with the participation of the civil society. ENDA is involved in a number of pilot projects in this region. One of the two sites visited by the appraisal team was l'école polytechnique where the wastewater is passing an abandoned treatment plant and a nearby farmer uses raw sewage and groundwater for irrigation of fruit trees.

**Railway site in Rufisque**

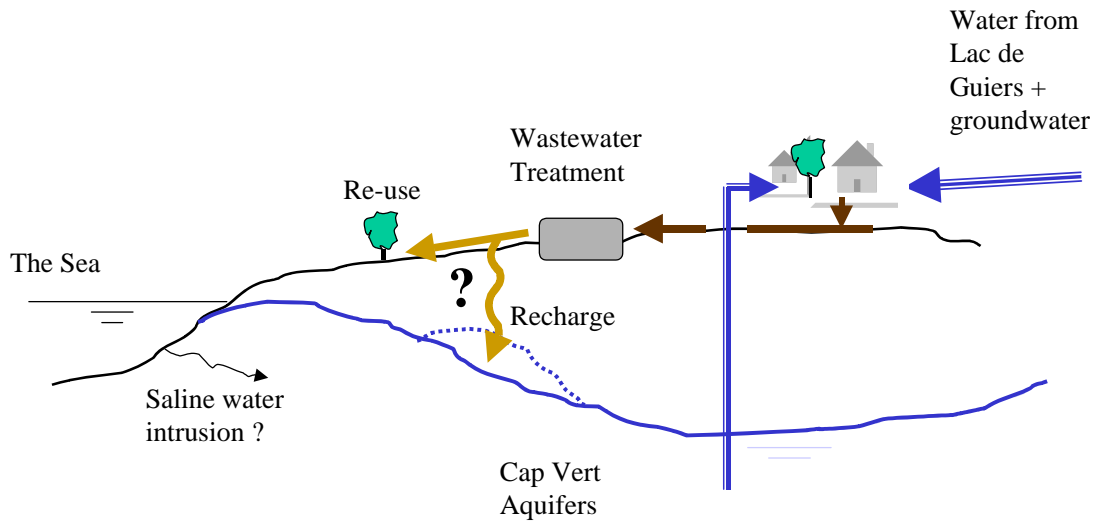
**Figure 7.** Discharge area for wastewater from railway operations



This area is in the hinterland between rural and urban communities. Wastewater from cleaning and maintenance of locomotives and railway equipment is discharged into a channel with vegetation to an irrigation area some 500 metres away. It appears from the discharge area that the wastewater contains oil pollutants (see picture). Even if the water seems clean when used for irrigation, attention should be paid to the possibilities of micro-pollutants from oil and chemicals used for the railway operations, when considering this area as demonstration site for wastewater management under the Plan.



## Appendix D. Illustration of Wastewater Reuse and Groundwater Management Issues





## Appendix E. Location Map Dakar Region

(Source: Expeditamap)