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Improving Access to Safe Water:
Perspectives from Africa and the Americas

Water Resources issues in Senegal

What approach in Rural Arid zone

?

Prof Abdoulaye DIA,

Member of the National Academy of Sciences and Technics of SENEGAL
Chief Executive Officer of the Panafrican Agency of the Great Green Wall





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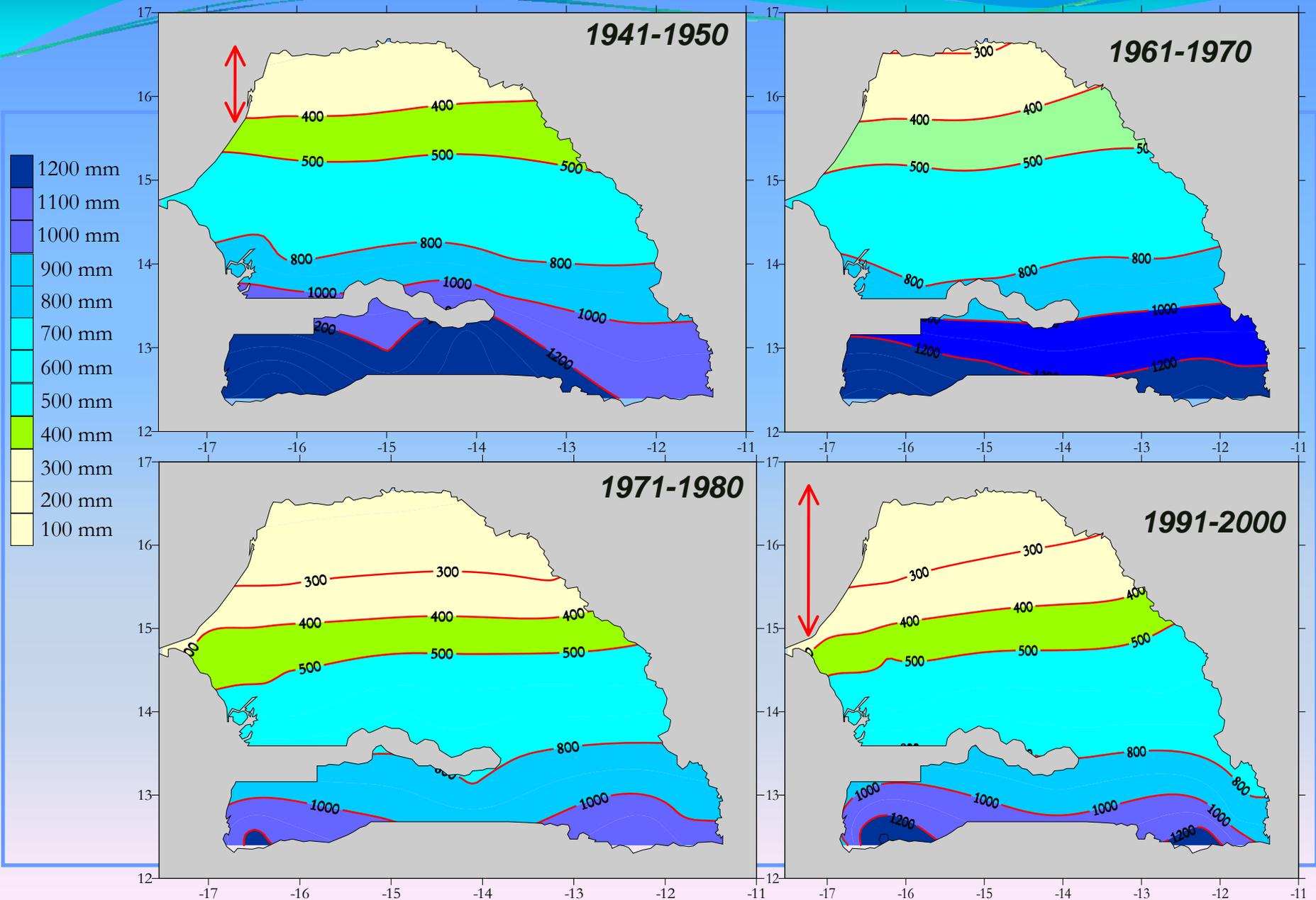
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SENEGAL FOCUS

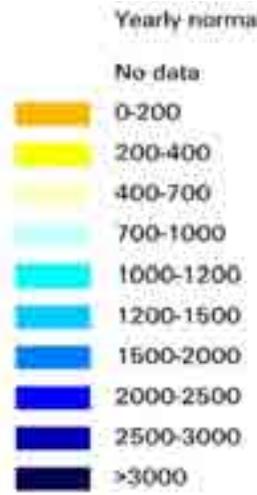
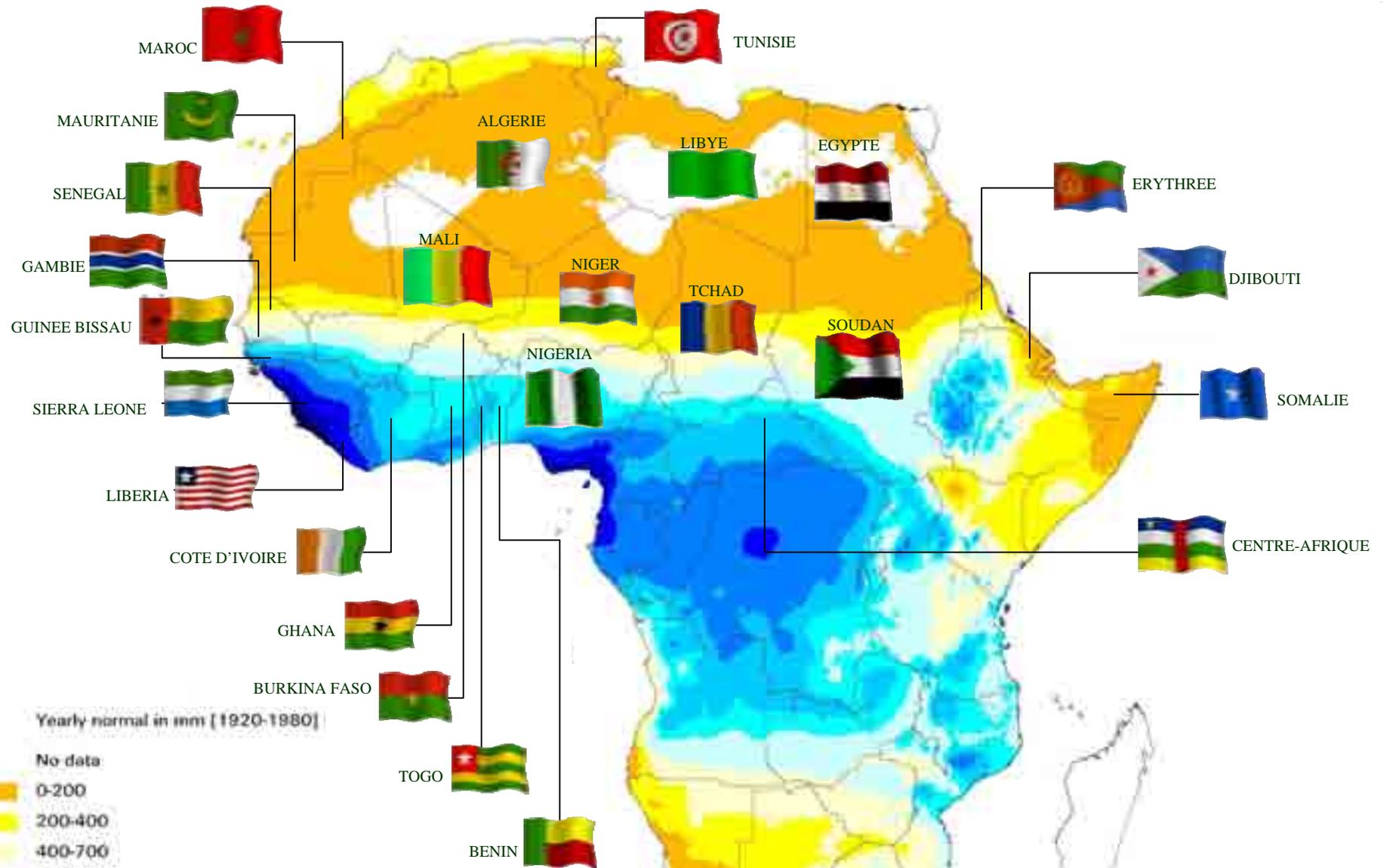


- **Western-most point of the Africa Continent ,**
- **700 Km large coastal marine domain (Atlantic Ocean),**
- **197000 sq Km.**
- **Sahel- Saharan domain, arid to semi arid Zone at the South of Sahara Desert,**
 - **Annual rainfall 200 to 800 mm /Year, Huge variations from year to year and from decade to decade and droughts are common,**

Average pluviometry: data from 1941 to 2000 (CSE, Dakar, Senegal)



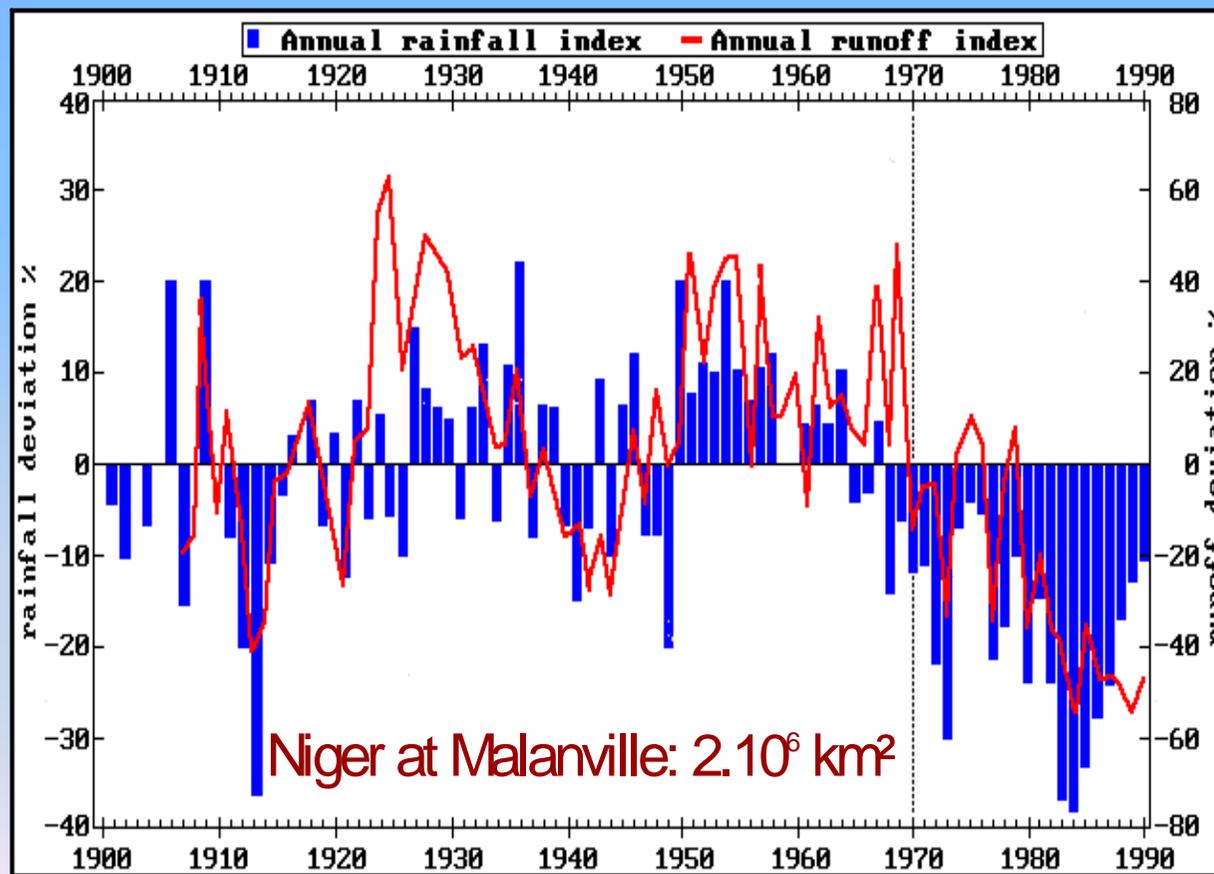
- **Physical scarcity of water at the centre and north parts of the country**
- **Important limitations and productivity : **Water and soil fertility****
- **Significant Water Resources (surface water and groundwater)**
- **High grade of Potential vulnerability and degradation of safe water do to various sources of contamination**



Annual Average Pluviometry (1920 – 1980)

Source data: NOAA, 2002 - Data preparation: ICRISAT, 2003 for ICRAF

Fluctuation and deficits in rainfall have profound impacts on African societies



☆Hydrological systems amplify the impact of rainfall fluctuations

☆Food production is linked to the rainy season (rainfed agriculture).

☆Diseases or their vectors are controlled by climatic conditions



Deforestation

Forest annual rate of regression (Source: World Forests Situation FAO, 2005)

States	Rate of Regression
1. Burkina Faso	- 15 000 ha/year
2. Mali	- 99 000 ha/year
3. Mauritania	- 10 000 ha/year
4. Niger	- 62 000 ha/year
5. Nigeria	- 398 000 ha/year
6. Senegal	- 45 000 ha/year
7. Tchad	- 82 000 ha/year
8. Sudan	- 956 000 ha/year
9. Ethiopia	- 40 000 ha/year
10. Eritrea	- 5 000 ha/year
11. Djibouti	--
Total	-1 712 000 ha/year



- **WATER
RESOURCES:
AN OVERVIEW**



INTRODUCTION

The water issue has become a national concern given the range of issues facing the sector:

- **scarcity, random nature of rainfall,**
- **vulnerability of water resources,**
- **disparity in their spatial distribution,**
- **actual or potential conflicts that posed by their operation and exploitation,**
- **quality degradation,**
- **lack of equity in access to resources between areas, social groups, different socioeconomic activities, etc..**



In Senegal, the field of hydraulics has always figured prominently in the Strategy of Economic and Social Development Plan. Since 1977, a series of programs and projects are operated.

At the end of 2000, The member states of the United Nations signed the Millennium Declaration, which leads to the definition of eight Millennium Development Goals (MDGs).

The key target: “Reduce by half, before 2015, the proportion of people without sustainable access to safe drinking water.”

I. WATER RESOURCES : AN OVERVIEW

1.1/ Surface Water

1.2. Groundwater

One of the strong recommendations of the Johannesburg Summit (2002) has focused on developing action plans for integrated management and water efficiency.

Senegal has 04 great hydrographic systems organized as a basin and most of which are transnational:

Senegal River, the mean course of Gambia River, Saloum River and Casamance River and a part on Kayanga before it enters to Guinea Bissau.

The Hydrographic network very high in the South of the Country, declines with heading North

The river system of Senegal having been transformed with the gradual operation of Manantali Dam (11 billion Cubic Meters), Diama Dam

About 150 Billion Cubic Meters per annum of rainfall water are lost to the sea





Groundwater Resources:

Two major geological domains:

- **Senegalese-Mauritanian sedimentary** basin (Maestrichtian sands, limestones, silicified clays, marls , volcanic formations. It covers about 80% of the country and includes:

a) **a system of shallow aquifers** with potential reserves (50 to 75 billion cubic meters with a seasonal average turnover (1.5 to 2 billion m³ / y. Approximately 175,000 m³ / Year operated by the SDE;

b) an intermediate aquifer system

c) deep system of Maestrichtian limestone and sand. It is very broad and supports a large part of water supply

- **The precambrian basement** in the South East part: granite and greenstones belts, metasedimentary rocks.



The Senegal compared to other Sahelian countries has enough water reserves sufficient for different uses and for the supply of drinking water.

However, the geographical distribution remains a problem, especially in central and northern regions of the country particularly at the Sylvo-Pastoral zone

The implementation of an Integrated Management of Water Resources is an important strategy for addressing challenges associated with achieving a balance between **water use** as a basic needs for the subsistence of a growing population, and **its protection and conservation** to ensure the sustainability of its functions and characteristics.

Plan of Action for the Integrated Management of Water Resources in Senegal

Funding: African Water Facility / African Development Bank (Grant No. 5600 / 155000851)

Action Plan Management of Water Resources (PAGIRE)

Main objective is "to contribute to the implementation of integrated water resource, adapted to national context and in accordance with the Senegalese Government's guidelines: fighting poverty, achievement of the Millennium Development Goals (MDGs) according to the accepted international principles for sustainable and environmentally water Resources Management .

The main challenge for Senegal is to improve access in particular to increase the rate of access of rural households to drinking water from 64% in 2004 to 82% in 2015

by ensuring a sustainable access to drinking water for 2,3 million additional people in rural areas.



Overall Objective: To revitalize the planning system and sustainable management of water resources of Senegal

Specific Objectives

- Improving knowledge on water resources;
- Improving the device inventory of WResources;
- Improving the system of planning of W Resources;
- Improving the regulatory management of Wres. (authorizations, compliance, drainage fee payment, royalty based pricing zones and aquifers and other water sensitive), **for financing the management of Water Resources**
- Strengthen the capacity of DGPRE

1.2: WATER RESOURCES: Legal and Institutional Framework

Legal and Institutional Framework for the Water Resources Management and appropriate Policies for access to water and sanitation in Rural and Urban Communities have been undertaken by Senegal's Government

Legal framework of Water Management

- Law n° 81-13, 4 th march, 1981 : **Water Legislation** - Mars 1981
- Decree 25 th June 1998 : Creation High Council of Water Conseil supérieur de l'eau
:To ensure the orientation, follow-up and monitoring (meets at least twice per year).
- Technical Committee - **Juin 1998 Ministère de l'Hydraulique**

SECTORAL POLICIES ON WATER: Many reforms have strengthened the capacity of the Ministry of Hydraulics to manage the exploitation of the Water Resources

- **Letters of Sectoral policies in 1995 and 2001:** institutional reform of 1995

(i) transfer of production, distribution and sale of **water** to a private operator under a lease contract for a period of 10 years, **SDE**

(ii) creation of a Heritage Company: the National Water Company of Senegal (**SONES**), linked with the State of Senegal by a concession of 30 years,

(iii) National Office for Sanitation of Senegal (ONAS) is responsible for project management of remediation and operation and maintenance of sanitation. It drafted a strategic view and improves the access for sanitation in urban and periurban areas

(iii) the achievement of financial sector balance

The Orientation Law Agro-forestry-pastoral.

Integrated Management of Water Resources through the PGRG and development of small irrigation **PAPIL**;

The Letter of sector policy for water and sanitation in 2005 :instrument for implementing the "Programme for Water Supply and Sanitation for the Millennium

MINISTRIES: Authorities responsible for the implementation of the political orientations

Ministry in charge of sanitation and prevention

- Direction of Urban Sanitation;
- Direction of Rural Sanitation ;

Ministry in charge of Hydraulics

- Direction Urban Hydraulics ;
- Direction Rural Hydraulicsde l'Hydraulique Rurale ;
- Direction Management and planification of Water Resources
- Direction de l'Exploitation and Maintenance

PUBLIC COMPANY

Office du Lac de Guiers

NATIONAL COMPANIES (STATE SHAREHOLDER)

Sénégalaise des eaux - SDE

Société nationale des eaux du Sénégal – SONES

Office National de l'Assainissement

Ministry of Environment,

Ministry of Health

OMVS: Senegal River Organization: Interstate Organization for the Senegal River : *Senegal/ Mauritanie/Mali and Guinea*

National Academy of Sciences and Techniques (ANTS):

-Capacity Building,

-Seminars and conference: Water Resources Management, **Water and Health**, (African Science Academy Development Initiative: USNAS, IDRC, SENEGAL Gouv.): *Transdisciplinary approach*

Universities:

- **Masters,**

- **Ing.**

- **PhD:** Water and Water Quality,
Georesources/ Imagery/Environment/ Management
Hydrogeology/Hydrochemistry/Isotopes

II. KEY ACCES TO CLEAN WATER AND SANITATION

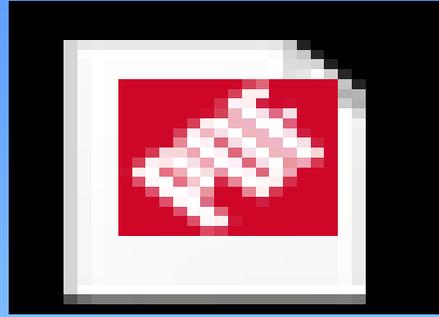
2.1. **Policies for access** to water in Rural and Urban Communities

2.2. **Water Quality:** Contamination, Treatment and Remediation

2.3. **Access to water for Sanitation and Hygiene:** water-related diseases

2.4. **Water access:** challenges and Success





pepam rac 2010.pdf

PEPAM: The millennium programme for drinking water and sanitation (PEPAM) of the Senegalese government aims, within the framework of the MDGs.

To reach the achievement of the MDGs , PEPAM, is the sum of efforts from several **actors: The State, the civil society, the local collectivities, the NGOs, the private sector and the Financial and Technical Partners**



**RAPPORT FINAL
DE LA REVUE**

REVUE
ANNUELLE
2010



The 7th MDG “ensure environmental sustainability

The following target: “Reduce by half, before 2015, the proportion of people without sustainable access to safe drinking water.”

SENEGAL: to increase the rate of access of rural households to drinking water by ensuring a sustainable access to drinking water for 2,3 million additional people **from 64% at 2004 to 82% in 2015.**



PEPAM Objectives in Rural Area

- Ensure the sustainable supply of drinking water of 2.3 million people, and raise the rate of access of rural households to safe drinking water by 64% in 2004 to 82% in 2015.
- Allow to 355,000 rural households equipped with an autonomous system of excreta disposal and domestic wastewater, and improve the access rate to sanitation in rural areas by 17% in 2004 to 59% in 2015.
- Ensure the sanitation of the main public places of rural communities through the implementation of 3360 public lavatories (schools, health posts, weekly markets, bus stations, etc..).

PEPAM objectives in urban

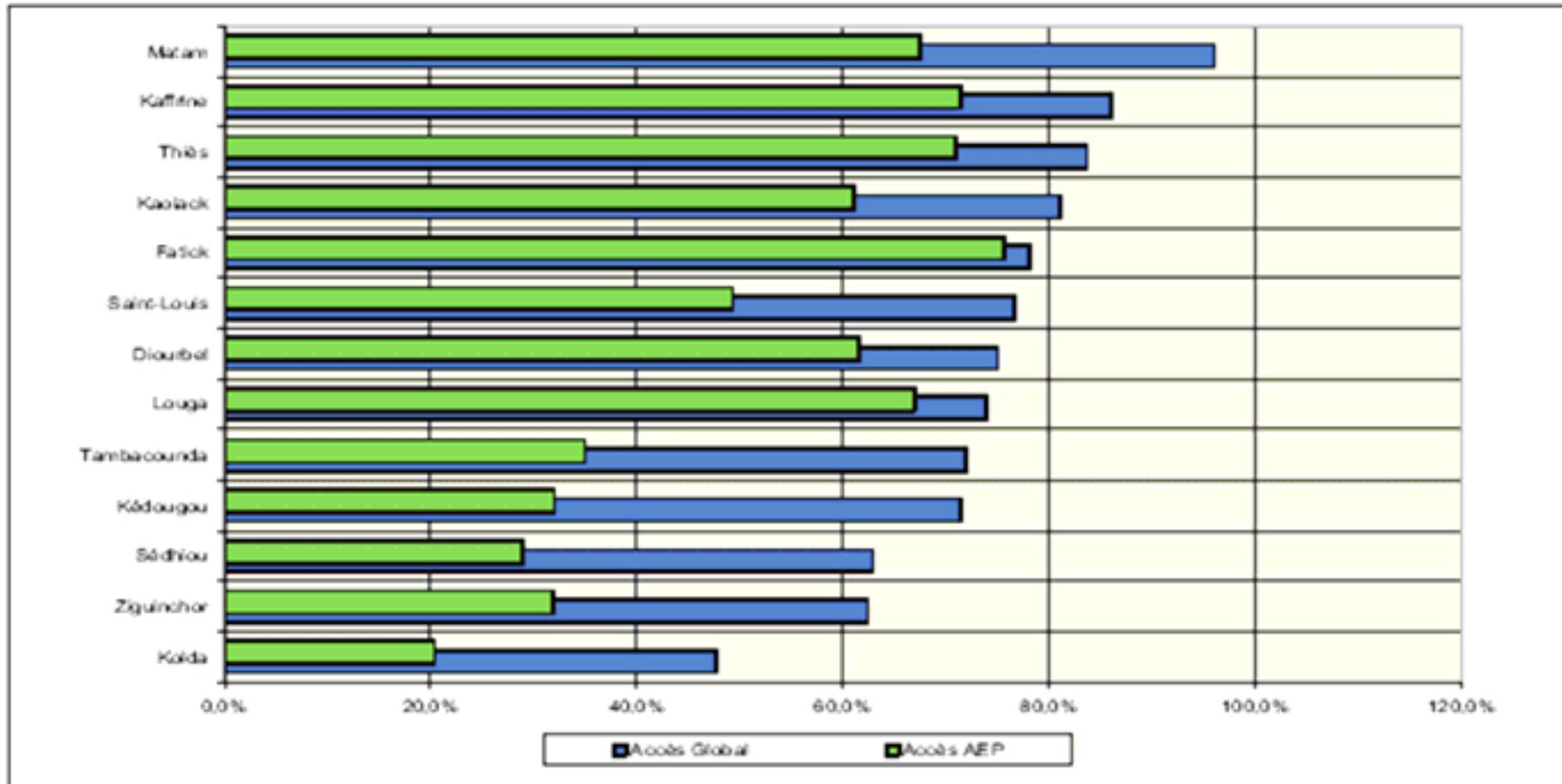
- Ensure water supply by separate branch of 1.64 million people, and in 2015 reached a connection rate of 88% in Dakar and 79% in the centers of the interior, against respectively 75.7% and 57.1% in 2002.
- Allow to 1.73 million additional people access to sanitation services, and raise the rate of access to sanitation by 56.7% in 2002 to 78% in 2015.

2.1. Policies for access to water in Rural communities

Strategical framework Reform

Faced with widespread difficulties in maintaining drinking water supply systems in rural areas, the Senegalese government launched in early 1997 a large-scale programme to reform the management of boreholes (REGEFOR), transferring the management of motorised drinking water supply systems to the associations of borehole users (ASUFORs),

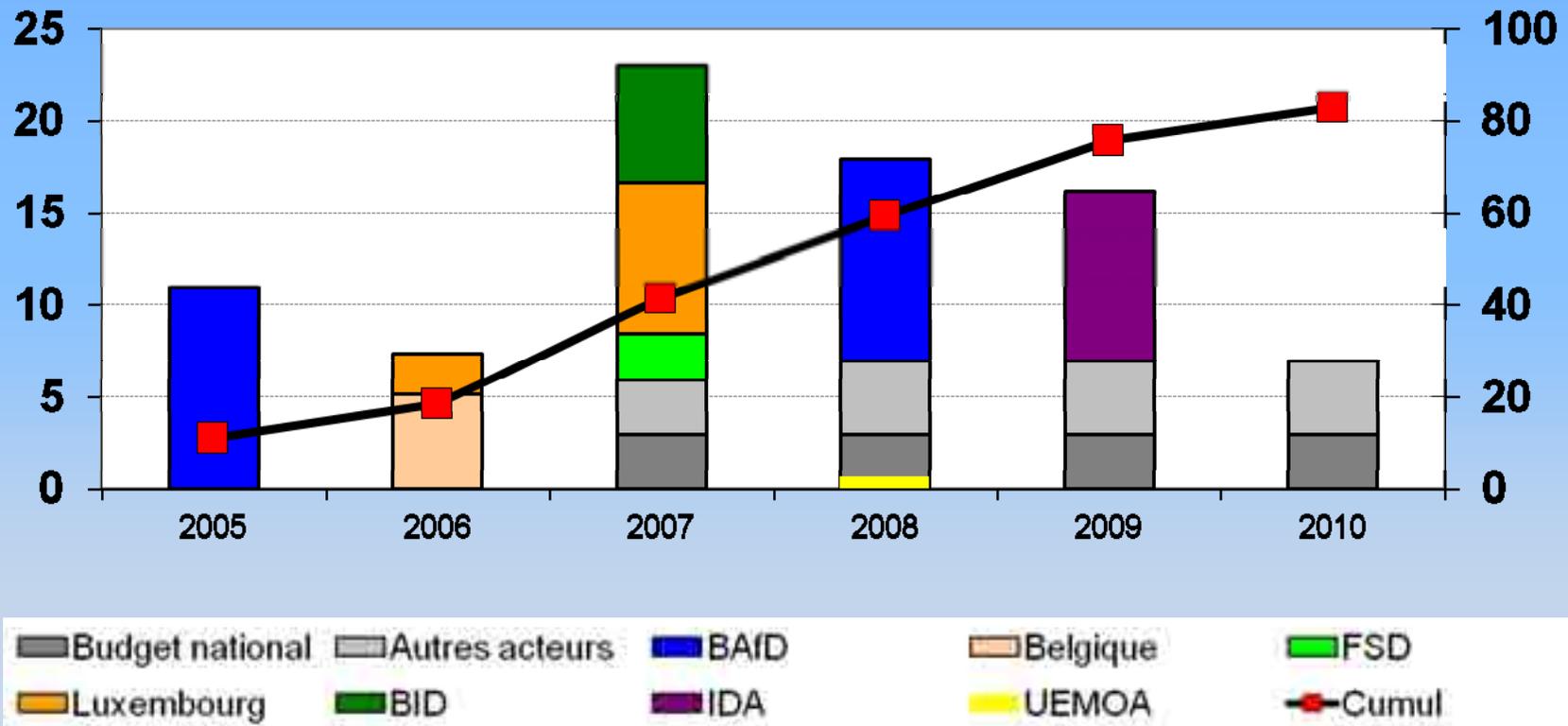
Situation de l'accès à l'eau potable par région au 31 décembre 2008



SITUATION ACTUELLE DE LA MOBILISATION DES FINANCEMENTS DU PEPAM RURAL

		Rural		
		Prévu	Réalisé	%
Eau potable	Montant (Milliards FCFA)	166	128	77

Funds Raising SITUATION



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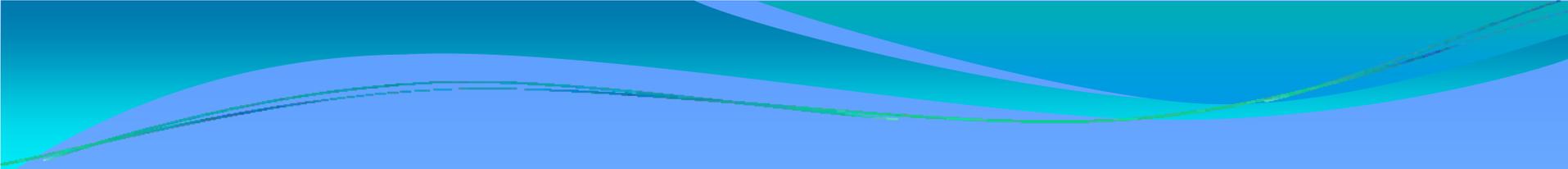




STRENGTHS AND WEAKNESSES

Strength and **weakness**

- **Donor commitment to PEPAM**
 - **Involment of Populations in programming and managing infrastructures structures**
 - **Protection of water quality is improved**
 - **Taking into account the sanitation component**
-
- **Procedures still Long and Hard**
 - **Lack of strategy and investments mechanism of renewal of infrastructures**
 - **No Guarantee for Sustainability of financing at the rural area**



2.2. **Water Quality:** Contamination, Treatment and Remediation

Mineralization of water are essentially: Iron, Fluoride, nitrates and some other metals.

Contaminant sources:

- anthropogenic pollution including waste water discharges, runoff and leaching irrigation water (pesticides, fertilizers), mining wastes
- salt water intrusion in coastal areas causing serious degradation of coastal aquifers

Presence in high concentrations in drinking water of certain types of contaminants such as fluorine is the cause of fluorosis and other water-related diseases.

Exploitation du Panneau de Tobéne



- **Anthropogenic pollution** is linked to emissions of chemicals, industrial and agricultural.



- **Eutrophication processus** : Fresh water has become permanent, creating ecological conditions favorable to the growth of freshwater highly invasive species plants (*Salvinia*).



The major problem since 1993/94 is the impact of dams on the health of populations:

- increase in the prevalence of water-related diseases that were already known in the area (malaria, urinary schistosomiasis, diarrheal diseases, intestinal parasites),
- appearance of intestinal schistosomiasis, in a much more dangerous aspect (urinary schistosomiasis)
-

Projet IGCP UNESCO

Mapping , monitoring of bio-geochemical cycles of trace elements

Pesticides

Pesticide use is a high risk :

- Pollution of water and transfer into the food chain.
- WHO counts every year 25 million cases of pesticide poisonings and 20. 000 deaths.
- Developing countries consume 80% of pesticides and 99% of poisonings are from developing countries

Éléments chimiques biologiquement actifs

30 éléments dont 15 particulièrement nuisibles

(Cr, Ni, As, Nb, Ag, Cd, Ba, Hg, Pb, Th, U)

Roches, eaux,
sols

Minéralogie, Géochimie des terrains et
Environnements immédiats

- Determination of interactions fragile terrestrial and marine ecosystems and the major biogeochemical cycles
 - The multi-element geochemical surveys on soil cultivation, mining sites and aquifers provide good tracking of these pollutants.
- The surveys used to obtain reference values for detecting contaminants Geogenic (products of soil leaching , groundwater pollution) of Anthropogenic (domestic waste, industrial products, etc...

Techniques for water treatment.

- **Physico-chemical standard** (sieving, filtration, disinfection, pre-oxidation, coagulation / flocculation and neutralization reactions to certain chemical elements with the exception of chlorides and fluorides)
- **Defluorisation processes of drinking** (UCAD / ESP), reverse osmosis, electrodialysis, nanofiltration process (cheaper method: 90 FCFA/M3);

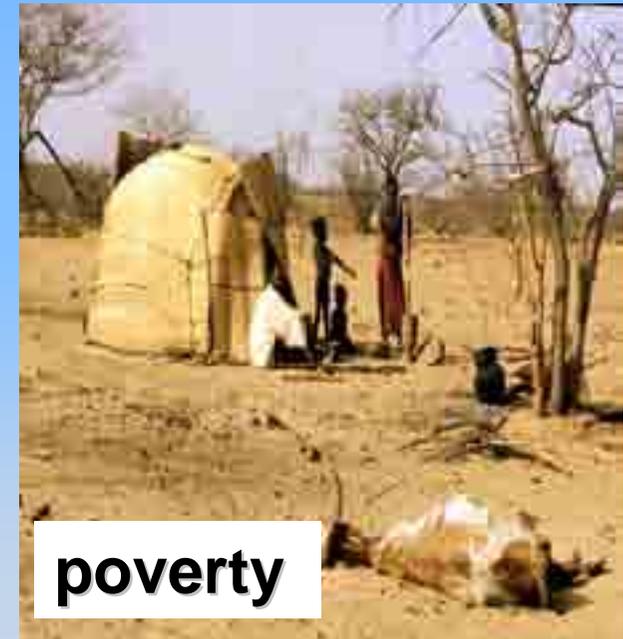
Water Sanitation treatment in Senegal:

- Important efforts have been made since 1970
- 1994 about 610 Km of collective sanitation network in Dakar conveying around 180000 Cm of waste per day, 10000 Cm were treated before release at sea
- Five intensive classical treatment plants were listed in Dakar, 01 in Saint Louis, 01 in Louga and 01 Kaolack (extensive plants of Lagooning type)
- At 1993, only 30% of the Dakar Population were connected to sewer system, the rest using individual systems (Latrines type toilets, Cesspool type toilets, septic privy-type toilets)



III. GREAT GREEN WALL PROJECT

CLIMATE CHANGE, DESERTIFICATION: FIGHTING STRATEGIES



**THE GREAT GREEN WALL:
AFRICA'S MAJOR PROJECT**



PANAFRICAN AGENCY OF THE GREAT GREEN WALL



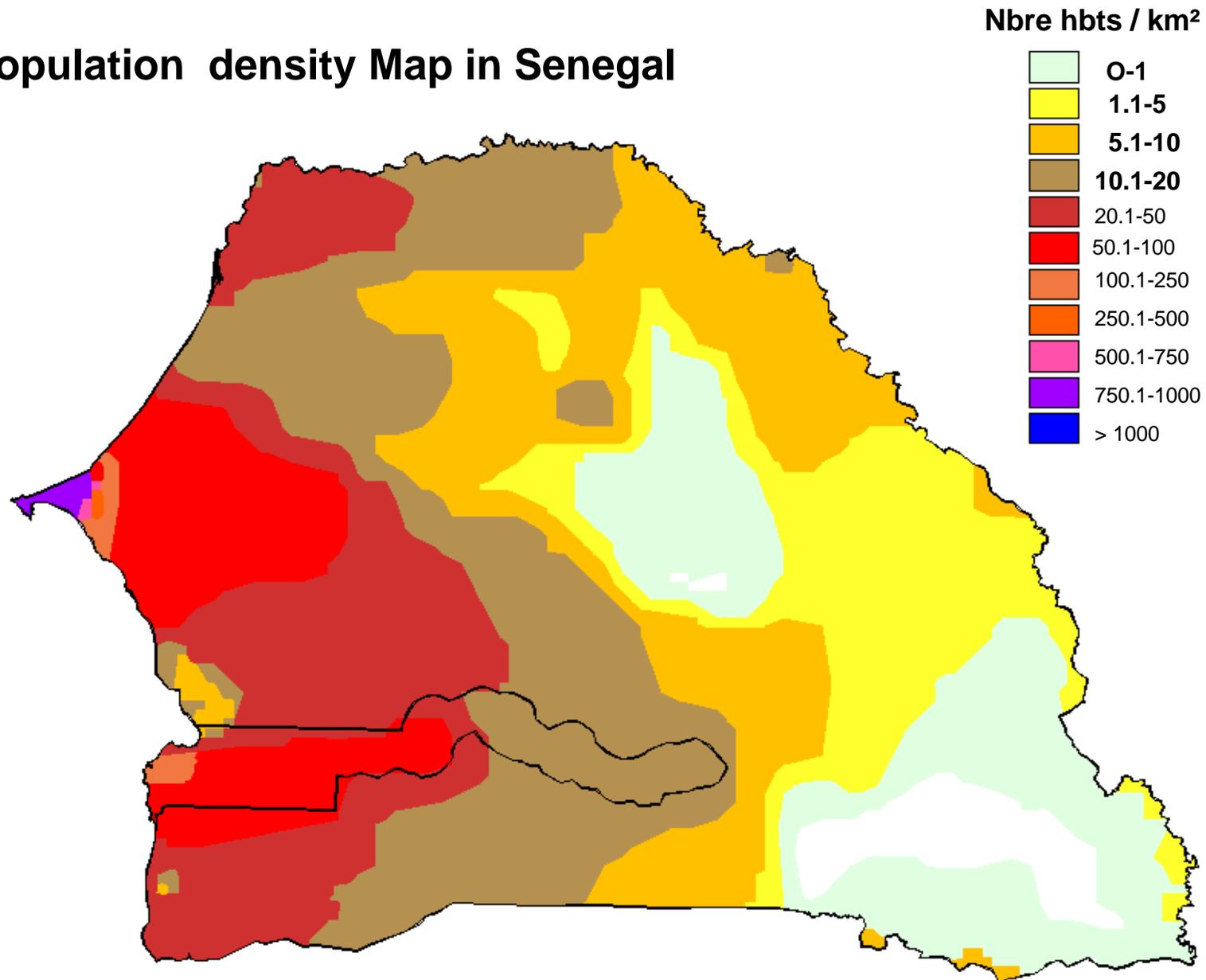
Deforestation

Forest annual rate of regression (Source: World Forests Situation FAO, 2005)

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11. Djibouti	--
Total	-1 712 000 ha/year

Migration of populations to the coast

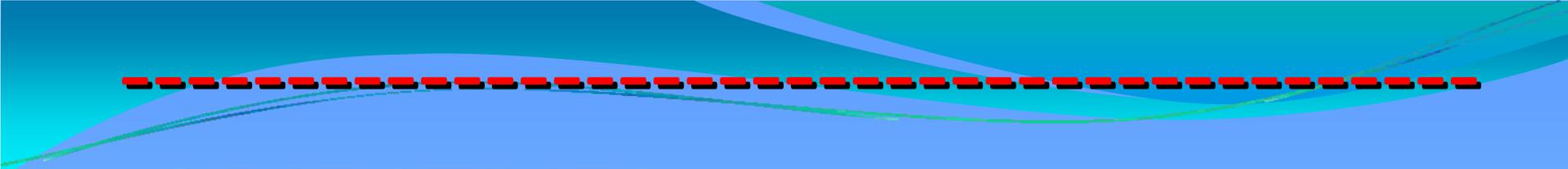
Population density Map in Senegal



GGW Régional Line



N	PAYS	Distances (km)	Superficie (Ha)	EqTC
1	Sénégal	443	664500	664500
2	Mauritanie	867	1300500	1300500
3	Mali	886	1329000	1329000
4	Burkina	604	906000	906000
5	Niger	933	1399500	1399500
6	Nigéria	352	528000	528000
7	Tchad	893	1339500	1339500
8	Sudan	1520	2280000	2280000
9	Erythrée	387	580500	580500
10	Ethiopie	589	883500	883500
11	Djibouti	209	313500	313500
TOTAL		7683	11524500	11524500

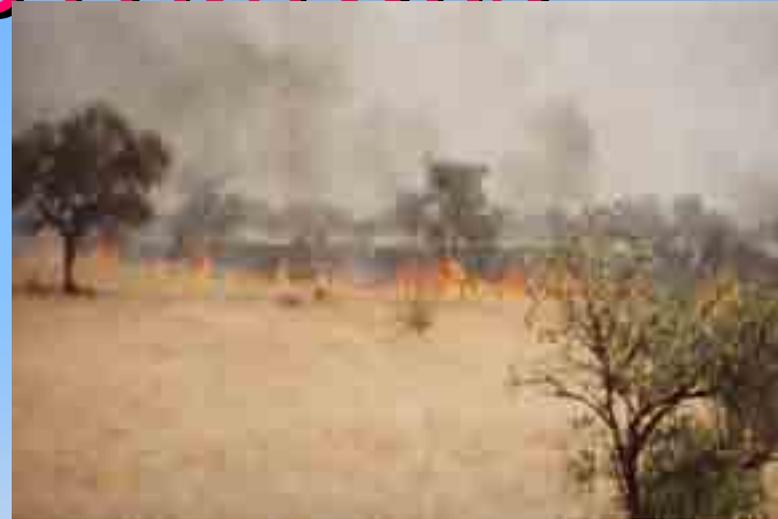


OBJECTIVES

- i. Conservation/biodiversity valorization;**
- ii. restoration/soil conservation will induce the development and diversification of agriculture and livestock,**
- iii. mastering water resources, with the implementation of water retention basins and hydraulic facilities along the corridor**
- iv. improving carbon capture and reduction of greenhouse gas emission.**

GGW SUCCESS FACTORS

- **Fight against forest fires:**
populations awareness,
prevention (premature fires
and firewalls) and active
fight.



Water retention basins: a solution for the development of fish farming, gardening, pastoralism and other income generating activities



Water Retention Basins to collect runoff, sheet floods or slipstream and to storage the huge quantity of rainfall Water (about 150 Billion Cubic meters.

Its a means for providing the Water needs of small rural communities.

A programme of Water Retention Basin is initiated in almost saharo-sahelian countries and can supply water for livestock, small irrigation, domestic use, and to improve the livelihood of rural population

Senegal has initiated a large programme entitled *bassins de rétention et lacs artificiels* », to make water provisions for arid zones

GGW SUCCESS FACTORS

**Water retention basins:
on average 01 reservoir is
planned for each 25 square
kilometres**



SENEGAL'S COMPONENT LINE



Surface = 762145,51 HA; Length = 543,035 KM

Thank you for your attention !



The Millennium Gate
Dakar, Senegal

SYNERGY: AREAS FOR COOPERATION

- Capacity building including training and education in data collection, processing, analysis, interpretation, Remote Sensing and Modelling/Data Assimilation towards products generation.
- Development/Reinforcement of University Curricula (Chairs in Oceanography and Marine Sciences)
- Joint Working Groups and Activities
- Ultimate Goal: Regional Centers of Excellence