

Observatoire
du Sahara
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Achieving the Sustainable Development Goals in the Sahel Countries

Mobilizing the Iullemeden - Taoudeni/Tanezrouft Groundwater Resources A part of the solution?



February 2017

FEW REMINDERS...

1981 : The UNO proclaimed the period 1980-1990 as the « International Drinking Water Supply and Sanitation Decade » to ensure drinking water provision and adequate basic sanitation for populations.

1990 : The results were underwhelming particularly due to an under-estimation of investments and of the necessary time to achieve the objective set.

1996 : Creation of the Global Water Partnership (GWP) in order to initiate and promote Integrated Water Resources Management. By 2016, the implementation of IWRM in sub-Saharan Africa has not yet achieved an advanced stage.

2000 : The United Nations adopted the Millennium Development Goals. Expected to be achieved in 2015, the overall results of these goals have been assessed as unsatisfactory.

2015 : The 193 countries represented in the UN General Assembly adopted the Sustainable Development Goals, one of which is to ensure, by 2030, access to drinking water for all (SDG 6).

The **Paris Climate Agreement**, signed in December 2015, commits countries to implement climate change mitigation and adaptation measures.



Traditional well, Niger, 2009

FACTS AND CHALLENGES

Algeria, Benin, Burkina Faso, Mali, Mauritania, Niger and Nigeria share a considerable groundwater resource : The lullemeden and Taoudeni/Tanezrouft Aquifer System (ITTAS). Extending over a total area of 2,5 million km² (Fig. 1), the ITTAS is crossed by the Niger River over about 2480 km (1700 km in Mali 540 km in Niger, 140 km in Benin and almost 100 km in Nigeria).

Several types of climate characterize the basin from the North to the South: arid, semi-arid and dry sub-humid.

Annual precipitations range between more than 1000 mm in the South to less than 100 mm North the basin.

The proportion of people living below the poverty line varies to reach sometimes the double from urban areas to rural areas (ECOWAS, 2006). In addition, this proportion is higher among women than men.

More than 60% of the working population are engaged in the agriculture sector, the first employer of the labour force despite its low pay compared to other sectors.

Geographical extent of the GICRESAIT project area of interest

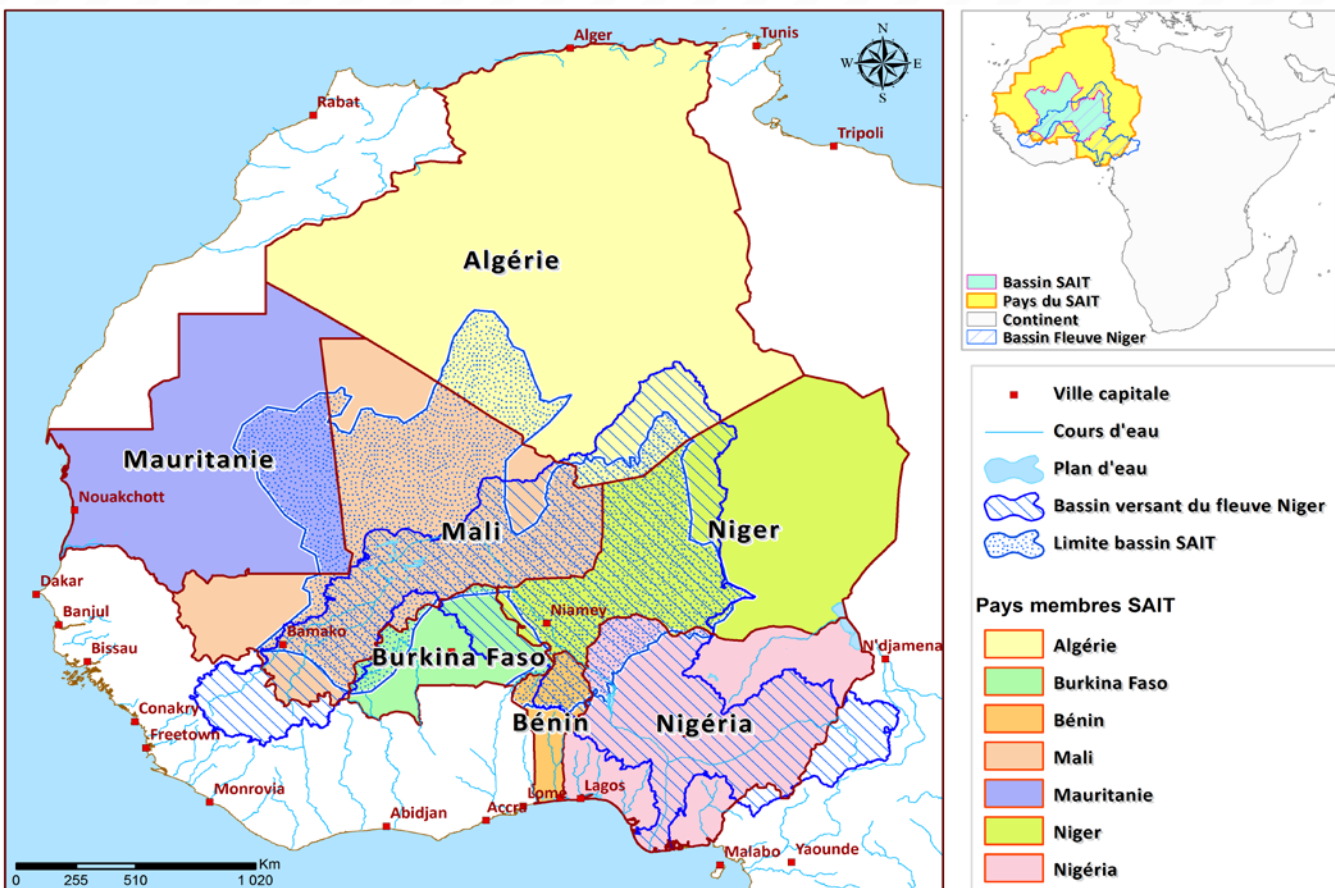
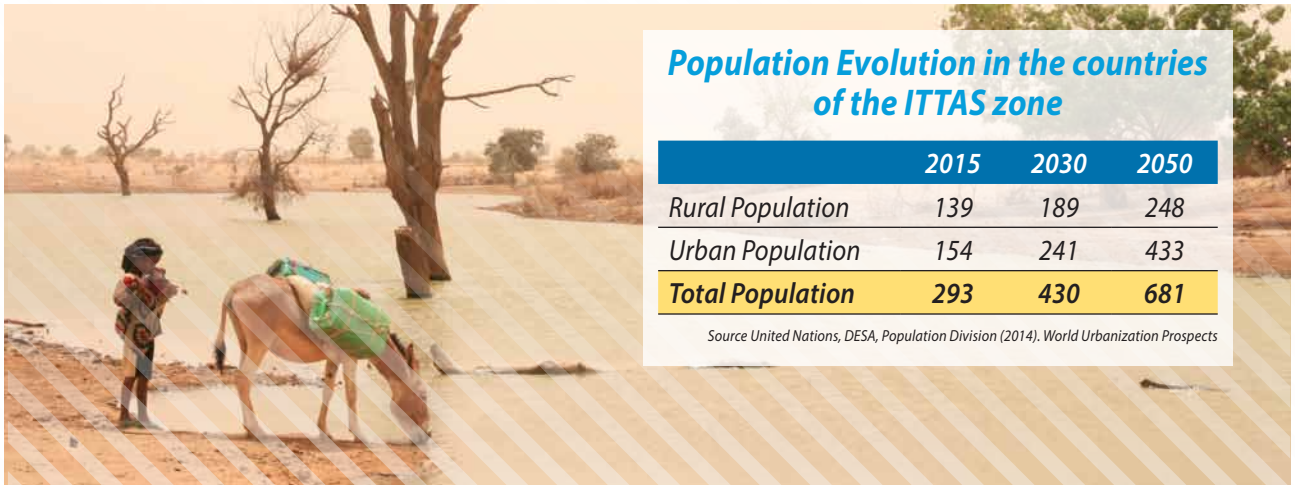


Figure 1 : Limits of the lullemeden-Taoudeni/Tanezrouft Aquifer System

* The GICRESAIT project « Joint and Integrated Water Resources Management of the lullemeden -Taoudeni/ Tanezrouft Aquifer Systems and the Niger River» is coordinated by OSS (2010-2016) and aims at improving the knowledge of the basins water resources. www.oss-online/gicresait



Traditional well, Niger, 2009

Population Growth

According to the UNDESA¹ projections, the rapid increase of population in West Africa will be translated in a doubling of population each 20 years, with a clear variation among rural and urban areas. The region's urban population is expected to increase fivefold between 2010 and 2050.

For Burkina Faso, Mali, and Niger, the total population is projected to double between 2010 and 2030 (will increase from 15 to 30 million inhabitants), and for Nigeria, is expected to reach more than 250 million inhabitants in 2030. This evolution will result in an increase in water consumption for different usages and an increased pressure on the environment and natural resources (pollution related to wastes and sanitation, deforestation, destruction of humid, and soil salinization).



Floods in Niamey, following the Niger River flooding 2012 (photo credit : IRD/T. Amadou)

Climate Change

West Africa has known a sharp decrease in precipitations in the last 50 years and a clear drought period between the years 1968-1972. This reduction is extremely clear in the Sahel region, with highly deficit periods in 1972-73, 1982-84 and 1997.

The region was also marked by exceptionally humid years in 1967-1968, 1969-1970, 1998-1999, 2010-2011 and 2011-2012. This led to a series of floods which caused significant damages and human life losses (81 persons in Niger, 365 in Nigeria in 2012).

¹- United Nations Department of Economics and Social Affairs

Water Resources Mobilization

Over a total of about 4000 km³ of annual renewable water resources in Africa, only 3,8% of these resources are mobilized (UICN-BRAO, GWP-WAWP, CILSS, 2003). The continent includes 1300 dams only, against 6000 in the United States and 20.000 in China.

Access to drinking water

The 2015 Africa progress report indicates that access to drinking water has improved, especially in urban areas, and that there is a strong disparity among urban and rural areas for certain countries.

As for the seven countries sharing the lullemeden-Taoudeni/Tanezrouft Aquifer System, 140 million persons of their total urban population (i.e. 80% of the total urban population) have access to drinking water. In rural areas, between 50% and 80% of the rural population have access to the ITTAS water resources (i.e. between 77 and 125 million persons).

Access to drinking water in urban and rural areas, 2015

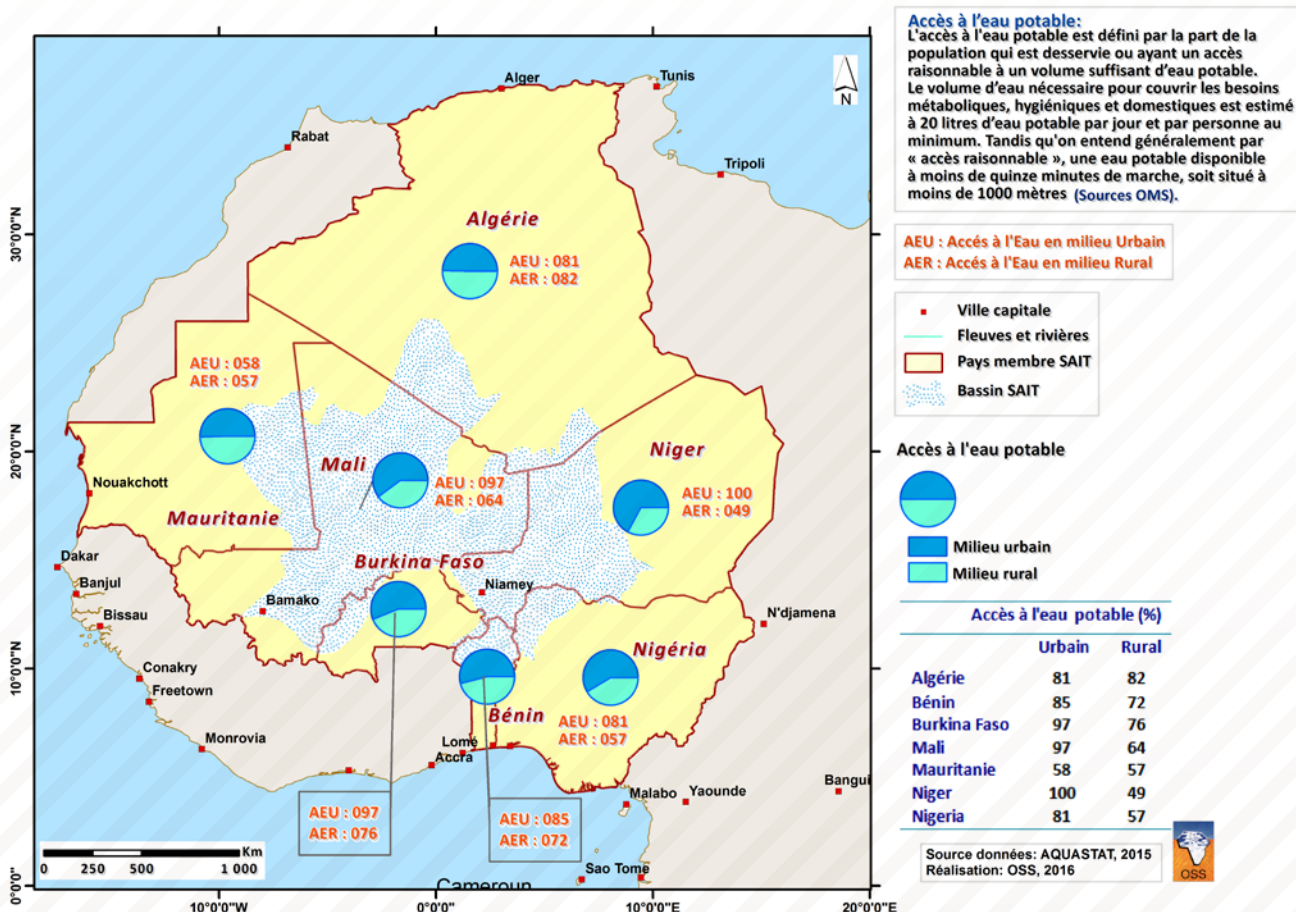


Figure 2 : Access to drinking water (%) in rural and urban areas

Access to drinking water in rural areas is a major challenge for countries in achieving SDG6 « Ensure availability and sustainable management of water and sanitation for all », (Fig. 2). This entails meeting a daily average need for water of 30 liters/day per inhabitant.



KNOWLEDGE AND POTENTIAL OF GROUNDWATER RESOURCES

The Niger River Basin included, hydrological basins have been subject to institutionalized joint management and knowledge for several decades. And contrary to the hydrological basins, transboundary aquifer systems have received no attention though they are the most threatened at the quantitative level (increase of water demand especially during drought periods), and qualitative level (pollution by various factors and exploitation of deep and highly mineralized waters).

A first initiative for an efficient management of transboundary water resources was conducted by OSS (2004-2009) on the lullemeden Aquifer System (IAS) (IAS, 500.000 km², shared by Mali, Niger and Nigeria).

This initiative was followed by the GICRESAIT regional project « Joint and Integrated Water Resources Management of the lullemeden - Taoudeni/Tanezrouft Aquifer Systems and the Niger River » launched in July 2010. The project main objective was to ensure the monitoring of the groundwater resources of the lullemeden and Taoudeni/Tanezrouft Aquifer Systems and to evaluate their potential and vulnerability to climate change.

An evaluated ... but little exploited renewable water resources potential

The water balances established by the mathematical models indicated a potential of renewable water resources of 11 billion m³ per year at the level of the Taoudeni/Tanezrouft Aquifer System and of 8 billion m³ per year for the lullemeden basin.

Out of these **19 billion m³/yr**, only 350 million m³ (i.e. less than 2%) are exploited, almost exclusively for supplying the need of populations and livestock.

Estimated at 4.200.000 inhabitants, almost the total population living around the basin live in a state of "theoretical water comfort" (4565 m³/inh/yr), while access to water is generally relatively difficult depending on countries and areas (urban and rural) (Fig. 2).

Confirmed Hydraulic exchanges between the Niger River and the Aquifer systems

The Niger River plays a major role in feeding and/or drainage of the aquifers as it supplies them with more than 1,5 billion m³ per year at the level of the Taoudeni/Tanezrouft basin upstream and receives more than the double of this volume (3,3 billion m³ per year) downstream the lullemeden basin.



Artesian borehole, Banizoumbou - Niger, 2007

Areas with high water potential

The project allowed to identify certain areas with high groundwater potential (Fig. 3) as a result of:

- Connection with surface waters, which helps to ensure a regular feeding of the aquifer systems, especially during water deficit periods
- Significant and highly permeable aquifer formations.

Areas with high water potential

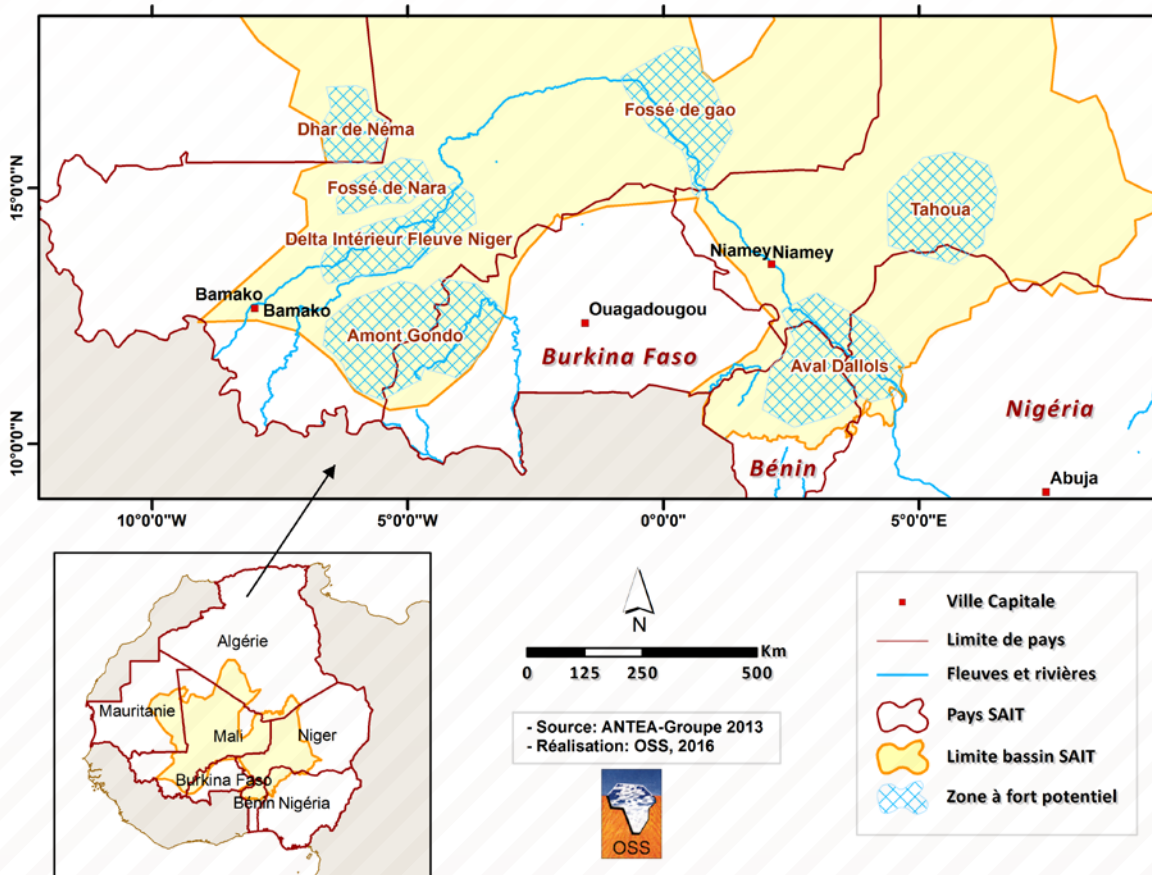


Figure 3 : Areas with high groundwater potential identified (OSS, 2013)

Areas with high water potential

The hydrogeological studies conducted within the GICRESAIT project framework highlighted the presence of sectors featuring high groundwater potential, mainly as a result of:

- ▶ A connection with surface waters ensuring a regular feeding of the aquifer systems, even during water deficit periods. This include :
 - The Inner Delta of the Niger River in Mali
 - The Dallols downstream in Niger and Nigeria
 - The Mouhoun basin upstream of the Gondo plain in Burkina Faso
 - The Gao Graben in Mali and Niger
- ▶ The power of the aquifer formations and their permeability :
 - Tahoua sector in Niger
 - The South sector of Dhar de Néma in Mauritanie
 - The Nara Graben in Mali

Vulnerability of the ITTAS to climate change

It was estimated based on several factors: the water table proximity to the surface, its sensitivity to climate change, its proximity to a perennial stream, environmental factors limiting or facilitating local recharge.



Renewable water resources protected against climate change

The decreased level of the water aquifer caused by climate stress and increasing exploitation is a concern of priority for water managers and decision-makers.

A mapping of the water aquifer level highlighted the presence of « vulnerable » and « risk » areas. These areas require a particular attention in terms of « monitoring/vigilance » as well as knowledge improvement.

In general, more than 80% of the study territory is little vulnerable to the decrease of the piezometric levels (Fig. 4). The North sector seems sufficiently « preserved » against this vulnerability given the depth of the aquifers and low proportion of population living in this sector. Less than 20% of the zone is subject to a more or less increased vulnerability; this concerns mainly the areas of the Niger River hydrographic network where the water aquifer is close to the soil surface.

Vulnerability of groundwater resources to the decrease of piezometric levels due to climate change

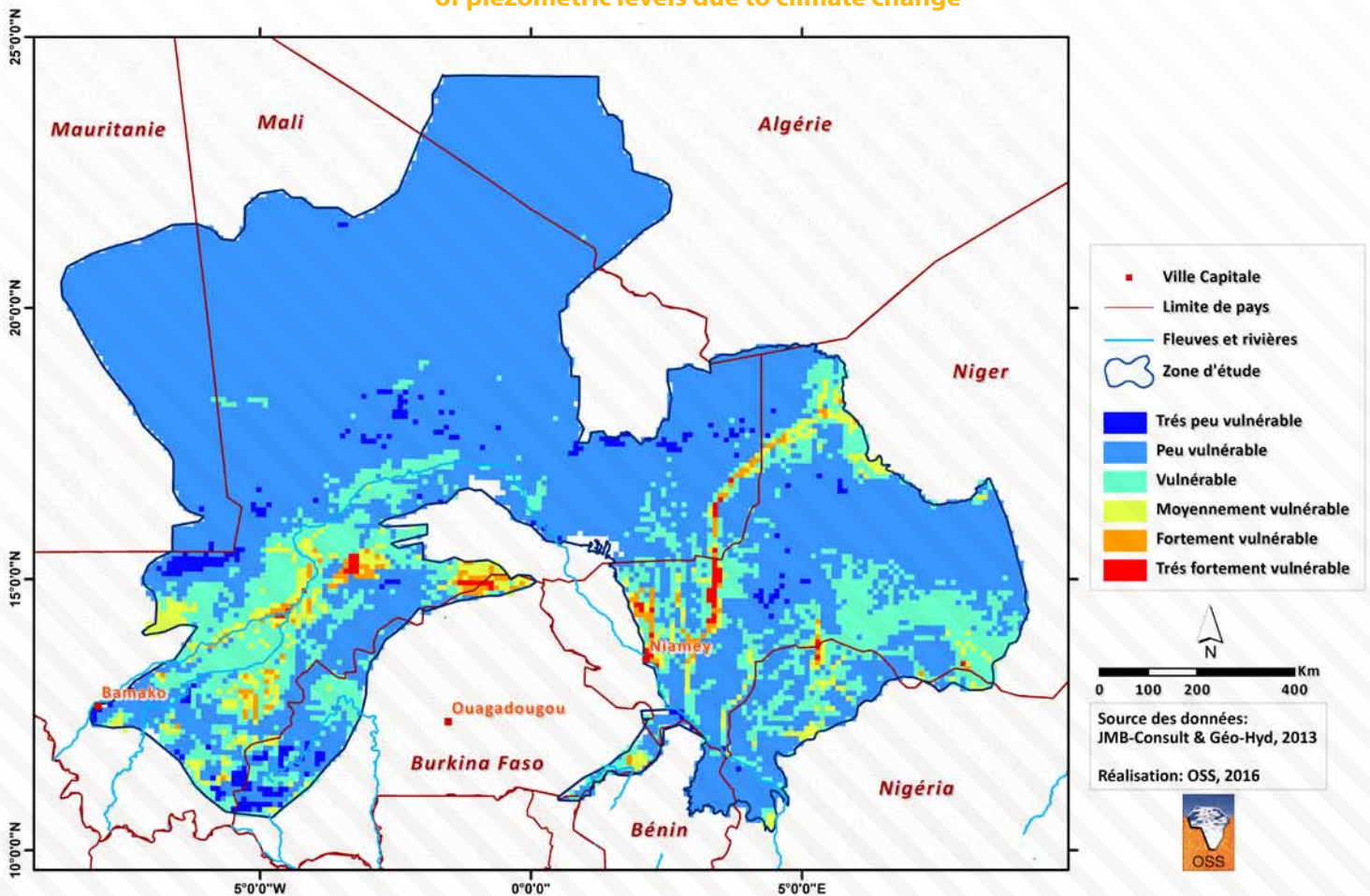


Figure 4 : Mapping of groundwater vulnerability to climate change

IMPLEMENTATION OF THE SUSTAINABLE DEVELOPMENT GOALS IN THE SAHEL REGION



Hydraulic installation, Banizoumbou – Niger, 2007

The adoption of the SDGs for 2030 by the General Assembly of the United Nations should trigger a dynamic in the African countries to attain the goals set as the latter are generally aligned with Africa's priorities.

Sustainable Development in Africa is highly dependent upon the goods and services provided by the environment and its natural resources. The countries of the GICRESAIT project area of interest should envisage partnerships to take full advantage of their different natural resources and hence act against poverty and food insecurity through joint and sustainable management.

OSS in close collaboration with the GICRESAIT project stakeholders have conducted two activities relating to groundwater resources which would allow in the long term to formulate a common vision between the countries concerned.



2nd meeting of Ministers of countries sharing the Iullemeden - Toudeni-Tanezrouft Aquifer System, held in Abuja – Nigeria, 2014

Concerted Management Framework

Aware that the efforts of a single country could not be sufficient to reduce or control the transboundary risks threatening their shared resources, the countries sharing the ITTAS have agreed on the creation and establishment of an efficient management framework called the « Consultation Mechanism ».

A draft Memorandum of Understanding together with a road map for the creation of a Consultation Mechanism for the seven countries concerned was adopted in March 2014 and signed as of now by the Benin, Mali, Niger, and Nigeria. Efforts are underway to obtain the signatures of Algeria, Burkina Faso and Mauritania.

Towards a Regional Master Plan for Surface and Groundwater Resources Allocation

Within the framework of the GICRESAIT project, OSS has proposed the elaboration of a regional Master Plan to be implemented in partnership with the Niger Basin Authority.

This will include:

- A regional diagnosis of countries' current and future needs (by 2030 and 2040) in terms of drinking water and water for agricultural and industrial purposes, in relation with adaptation to climate change
- Identification of the agricultural, mining and industrial development potentials of each country
- Planning for water allocation using all the resources with high water potential identified and available by 2030 and 2040, and planning for associated investments
- Strengthening the role and action of the Consultation Mechanism

This would allow to:

- Fulfil the populations' increasing needs for water
- Enhance the arable lands on the basin estimated at more than 137 million hectares
- Improve food security in terms of quality and quantity
- Set up a regional transboundary infrastructure for economic development
- Create job opportunities and increase farmers' income.

The establishment of this master plan and of a groundwater management framework would certainly contribute to addressing the major challenges related to water facing the region.



Bridge across the Niger River – Niamey, 2009



Experts Meeting, Banizoumbou – Niger, 2009

SAHEL: MAIN SUSTAINABLE DEVELOPMENT GOALS

- Goal 1.** End poverty in all its forms everywhere
- Goal 2.** End hunger, achieve food security and improved nutrition and promote sustainable agriculture
- Goal 6.** Ensure availability and sustainable management of water and sanitation for all
- Goal 13.** Take urgent action to combat climate change and its impacts
- Goal 15.** Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss
- Goal 17.** Revitalize the global partnership for sustainable development



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