

# Women and Development in Climate Change Context: Female Salt-Collectors of the Pink Lake (Senegal).

TINE Mor

Université Gaston Berger de Saint-Louis

DOI: <https://dx.doi.org/10.47772/IJRISS.2024.803053>

Received: 19 February 2024; Accepted: 27 February 2024; Published: 04 April 2024

## ABSTRACT

Some decades ago, Sahel societies have been the scene of major upheavals related to climate change. These hazards especially read in terms of rainfall variability, droughts, water and wind erosion, floods affected the life of the populations and their activities, mainly agriculture. Besides, these societies are committed to struggle for the development process initiated since their independences (1960). Thus, Senegal did not depart from the rule. In such a context, women's initiatives appear as a response to meet the dual challenge of facing the climate change effects and participating in the development dynamics. This study aims at examining the scope of the women's activities exploiting the salt at the Pink Lake as a response to climate change risks and as participation in development. Therefore, it's about seeing how women's adaptation and resilience to climate change, through the salt collecting activity, constitute a contribution to development. With a triangulation of both quantitative and qualitative method, we use the questionnaire, interviews, documentary analysis, and sociological observation for the data collection. This study reveals that women of the Pink Lake with the income generated by the salt exploitation, help their households in meeting basic needs in a context which climate change, with its polymorphic effects, makes it difficult to practice activities such as agriculture, animal husbandry etc. This reflects the role that women play in climate change adaptation and development. But the constraints of the limited resources they make, the lack of information on climate change and the low level of association among other factors reduce their resilience and their level of participation in development dynamics.

**Keywords:** Climate change, women, adaptation, resilience, development

## INTRODUCTION

### Climate Change in the Sahel

In Africa, several studies have been carried out on climate change. However, we will only focus on the Sahel area since this study hinted at Senegal which is a Sahelian country. Since the beginning of the second half of the twentieth century, the climate has been a subject of reflection for many researchers.

Many of these studies showed that the climate variations have a consequential increase in the drought's frequency, a significant decrease in rainfall during the 20th century and a high variability (spatial and temporal) of precipitations. It is in this regard that FewNet and al. (2002); IPCC (2001) and Ozer P. and al. (2010) showed an increase in the drought's frequency in the Sahel area. In terms of rainfall, studies can be divided into two periods.

On the one hand, some studies have highlighted a significant decrease in rainfall recorded on the eve of 1970.

In an article titled "Climate change, drought and pastoralism in the Sahel", Brooks says that climate change

in pastoral areas is specific enough because his “production system is already in itself an adaptation to hostile environments.” Brooks explains in his paper that pastoralism appeared in Africa 5 000 years ago, precisely as a form of adaptation to climate change. However, with the current marginalization of pastoralists, their adaptation capacity could be eroded, and they may be more sensitive to climate change than other communities (N. Brooks, 2006).

In this same vein, Bouzou Moussa L. (2000) writes that: ” Drought has been partly responsible for deep changes in the pastoral area around the rainfall deficit years of 1968. The climatic degradation by the radical transformation of the landscape it has led to is seen as one of the factors of the agricultural systems’ development in the Maradi region. Abdou Ahmadou A. (2009) emphasizes his study on the role of external intervention in the populations’ adaptation through the introduction by the National Agricultural Research Institute of Niger (INRAN) of new varieties of seeds with short vegetative cycle for millet and sorghum bicolor.

On the other hand, studies show that the last half of the 20th century was mainly characterized by high rainfall variability (Gerard M and al: 2002; Abdou A. and al, 2008; Ben Mohamed A.: 2011; B. De PeyreFabregues: 1990; Hulme and al, 2001; MVK Sivakumar. 1992).

Ozer and Erpicum P. M. (1991) showed that significant rainfall fluctuations have affected Niger in the 20th century with a drastic drought since the late 1960s. Paturol JE (1995) notes that droughts in the second half of the 20th century also affected the countries bordering the Gulf of Guinea but with less severity of damage than in the Sahel region.

In the same context, Salissou A. (2009) showed that climate change is manifested by disturbances in planting dates, changes in the length of seasons, the increase in the frequency and duration of the winds, and by the frequency of dust and sandstorms. As regards Amoukou AI (2009), he stressed the peasant representations of climate change manifested by the change of seasons observed by the people, silting, pollution, disappearance of some ponds, the decline or disappearance of biodiversity and a change in the physiognomy of vegetation and a considerable loss of biodiversity.

Bernus E. (1996) considers that the drought was partly responsible for profound changes in pastoral areas due to rainfall deficit noted in the 1968s. The climatic deterioration, by the radical transformation of the landscape it has trained, is seen as one of the factors in the farming systems evolution in the region of Maradi (Bouzou Moussa I.: 2000). Similarly, the recurrence of droughts between 1971 and 2000 is the origin of land in the oasis basins dynamic system southeastern Niger (Issa B. and B. Yamba: 2009). Bernier X. et al, (1994), noted that the northern limit the area of rainfed crops in crisis which partially results from the impact of droughts. Bernier X. (1988), says that rainfall variations and their impact on agriculture and livestock have led to a relocation of the frontier to the pastoral field, and therefore pressure on the environment. In the same perspective but in Ethiopia, Camberlin and Beltrando G. P. (1995) point out that the 1983-1984 droughts were the cause of 500 thousand to 1 million victims and cereal production in 1984 has grown down 40% compared to normal values. They add that in Somalia there would have been between 1,000 and 5,000 deaths per day in June 1992. Houérou HN (1992) shows that droughts are a constant of arid although they entail significant agricultural production losses of large areas. For him, the Sahel has experienced several droughts between 1900 and 1950: 1895-1905, 1910-1916, 1938-1943 (BernusSavonnet and 1973, cited by The Houérou, 1992) and the drought continuously from 1970 to 1985.

Regarding specifically the case of Senegal, Cheikh Ahmadou Bamba Diop analyzes the phenomenon of climate change as a cause of food insecurity for vulnerable groups and low-income consumers or because of their own production, the loss of opportunities employment, either because of the decrease of their purchasing power due to rising food prices in the markets.

This works on manifestations and effects of climate change in the Sahel area are important, but they shorten the climate change issue which is much broader. They insist on droughts neglecting other recurrent problems related to the deterioration of the climatic conditions such as flooding, water erosion, salinization, rivers, land and groundwater, desertification etc. In addition, they rarely bring out the coping strategies used by people of the Sahel to face the dramatic droughts. Studies consider the adaptation strategies as an innovation or an adaptation to climate change is not new. Moreover, one can ask the question to know whether the damage attributed to the droughts are not the combined effects of several factors instead of focusing on in a single causality which makes climate change responsible for everything. Is a more systemic or holistic analysis necessary in the Sahel where the problems are intertwined? We should also make the difference between climate change as experienced by the actors and climate change that floods the media and institutions which are supposed to deal with it. The consideration of people representations on climate change is a premise to adaptation. First, they must recognize themselves in their situation before accepting its existence to cope with it. But what we are witnessing is hollow words that are not adapted to the daily lives of people. This raises a problem of climate issues' ownership by affected stakeholders, which are also supposed to cope climate change.

### **Women Climate Change and Development**

This conjecture of climate change does not ignore the actions produced in favor of the development in the African societies. Thus, it can be said that all research in relation with development should take into consideration this omnipresent factor that is climate change. This study dealing with the relation between women and development is far from departing from the principle.

Concerning the problem of women and development, it has been, for a longtime, the focal point of many thinkers of various sciences (sociology, geography, history, economics and so forth) however, it was differently dealt with in depending on the science field one belongs to. In our work, the stress is made on the relation between women and development.

It is worth noting that first women have been, in all the societies of the world, victim of marginalization in terms of development. Through an analysis of the historical trajectory of woman's situation, we can realize that despite the efforts that have been made by the international organizations (United Nation Organization, organizations of Brotenwoods) and the conventions signed on the improvement of woman's situation in all around the world, this social category continues to occupy an eccentric place in the process of development. Nevertheless, non-negligible projections have been noticed for some moments. These projections have been partly made possible thanks to the works of some international institutions such as (UNO Woman), the World Bank and so on. This latter is interested in the problem of women and development at the sixties.

*"The world Bank has started to be interested in the role of woman in development at the end of the sixties. The institution then granted a larger place to that question in its program in the context of the decades of the United Nations for women", (my translation).* [\[1\]](#)

In Africa, woman's situation has changed a lot not to say that it has evolved a lot from the pre-colonial period up to now from colonization, independences, but also the nineties. This change originated from many factors' colonization; the structural adjustment plans among which also the international conventions that are partly signed by many African countries (Issa Laye Thiaw, 2005).

As in many African countries, the Senegalese women have always played an important role in the society. They are traditionally assigned two roles: next to her role of mother, woman plays that of producer. But this contribution of the Senegalese woman in the production has always been disguised by statistics that most often are perceived as it was free work. This involved a confinement of woman in the private environment and kept her on the fringe of decision-makings. The combination of these different factors that can be

multiplied constitutes an obstacle to her involvement in the process of development.

Nowadays, we tend more and more to admit the place of woman in development. Women become more and more irreversible actors in the adaptation strategies as in the dynamics of development. It is in this respect that Grigori Lazarev and Mouloud Arab argue.

*“It is time to admit that the participative dynamics will remain dangerously compromised until we should not have better taken into account the significant role that play women in the rural economy and, particularly the role that they would play in the envisioned systems to improve the natural resources” ( LAZAREV Grigori et ARAB Mouloud, 2002) (my translation) [21].*

This relevant point of view reveals that the role of women is to be taken into consideration in the pursuit of a development mostly in climate change context.

The link between women and climate change has been established by some authors. Brody, A., Demetriades, J., Esplen, E. (2008) made a god paper which outlines key linkages between climate change and gender inequality, focusing particularly on adaptation and mitigation policies and practices. It seeks to identify gaps in the existing body of work on gender and the environment, which has focused primarily on women’s agricultural livelihoods, access to natural resources, or disaster risk reduction. Vandana Shiva has devoted few pages to women and ecologic question in his article entitled “Development, ecology and women”, in: Momsen, Janet (Ed), (2008), Gender and Development. Critical concepts in Development studies, Vol. 1, pp. 279-289 (reprint from 1989).

Some writers sustain the idea that climate change is not lived likewise by men and women. This is because men have the possibility to practice other paid activities, which is not the case for women. In so doing, in case of the disruption of the activities of production (agriculture precisely), women are the first to suffer from it. This is what reveals one report of Oxfam.

*“The effects of climate change in each area are the same for its inhabitants, but men and women rely on different assets and resources to face climate changes. In so doing, the women’s vulnerability is the most significant as well as their effects on survival policies. The impoverishment of the natural resources caused by the climate change affects more drastically the survival strategies of women”, (my translation).*

This same idea is defended by The UN Internet Gateway on Gender Equality and Empowerment of Women which recognize the gendered disparities of climate change. “In many of these contexts, women are more vulnerable to the effects of climate change than men primarily as they constitute the majority of the world’s poor and are more dependent for their livelihood on natural resources that are threatened by climate change” (UN Women Watch, 2009).

Women sometime are considered as great destroyers of environment through woodcutting for the cooking. A lot of their activities require the use of wood and, therefore, they participate in the dioxide of carbon emission (Ka Aminata, 1994).

However, others consider women as main actors in the struggle against the destruction of the environment. We notice also that few research has tried to show how women can be considered as resilient actors in a context of risks like climate change because they develop strategies of negotiation and of skirting to reduce the consequences of climate change. That’s why the UN Internet Gateway on Gender Equality and Empowerment of Women pursues:

*“It is important to remember, however, that women are not only vulnerable to climate change, but they are also effective actors or agents of change in relation to both mitigation and adaptation. Women often have*

*a strong body of knowledge and expertise that can be used in climate change mitigation, disaster reduction and adaptation strategies. Furthermore, women's responsibilities in households and communities, as stewards of natural and household resources, positions them well to contribute to livelihood strategies adapted to changing environmental realities”.*

Also, in a context of crisis in relation with environmental problems like drought or flooding, women play an adaptation role by exploring various opportunities. That's why, SALL M., SAMB A. TALL S.M. and Tandian A., talking about women of Gandiol (Senegal) wrote:

*“This training enables women to harness the positive synergy between policies on adaptation to climate change and the social changes needed for development. As men leave the area in response to the increasingly arid conditions, it is up to the women who are left behind to grasp any Socio-economic opportunities that arise” (SALL M., SAMB A. TALL S.M. and TANDIAN A., 2011)*

The Commission on the Status of Women showed that gender inequalities in access to resources, including credit, extension services, information, and technology, must be considered in developing activities designed to curb climate change. Women should also have equal access to training, credit, and skills-development programs to ensure their full participation in climate change initiatives [3].

In the Training Manual on Gender and Climate Change [4], it is admitted that empowering and investing in women are key to combating the effects of desertification and paving the way for poverty alleviation in the world's least developed countries. However, under the current climate change finance regime, women do not have sufficient access to funds aimed at covering weather-related losses, nor do they have funds to service adaptation and mitigation technologies.

## **METHODOLOGY**

### **Research Tools**

In this research we proceed to a triangulation of both quantitative and qualitative methods. This is due to the nature of our object which is multi-scalar. Some aspects of our object are quantifiable. While others are indeed quantifiable in certain respect but remain more perceptible in a qualitative approach. Therefore, the combination of both approaches which are complementary gives the opportunity of analyzing the phenomenon in all its dimensions.

As collecting tools, we have the questionnaire that we subject solely to the women extracting salts. Some conversation guides were elaborated for some aimed women and other key information. The sociological observation is used as tools as well the documentary analysis. Finally, we have adopted the autobiographical method notably the story telling of the women who extract salt. Other tools are called up among them the map of the area, the chart of the flow, the problem tree and so on.

### **Fieldwork**

We conducted field starting with interview and observations, we began since September, before the availability of funds since we were in Dakar during the holidays. On October 29, we continued the interviews until November 15. The choice to start with the interviews was strategic: this enabled us to correct and enrich the questionnaire. In total, we conducted interviews with about 19 persons: two 20 the Pink Lake, the general secretary of the Lake Management Committee, Vice President, 2 salt resellers, 4 antique sellers, and 9 women “coxers”. Most of these interviews are recorded; for others, we only took notes as some women refused to be registered.

This allowed us to have the necessary information on our target to proceed with the re-elaboration of the

questionnaire. We pursued the interviews until reaching the saturation point. We noted more redundancies in the information that respondents provided us with. Therefore, we began administering the questionnaire that has already been corrected, tested, and validated. The administration of questionnaires began on November 17th and continued until the 20th of December. For the administration of the questionnaire, we did not encounter difficulties at the beginning because we started with the women present at the lake during this period. We surveyed all of them; at least all those who had not categorically refused to undergo the investigation. But our problem was that this number was not up to our level sufficient to have a representative sample. This is due to seasonality bias because at that time, the amount of salt available in the lake was reduced and therefore some women had temporarily paused. So, we moved to Bambilor and Niague where mainly reside the women working at the lake. We went door to door to interview them but there have been many cases of reluctance. However, it should be noted that due to certain requirements related to our academic duties, we did not work during all this period. So, it took a few breaks over.

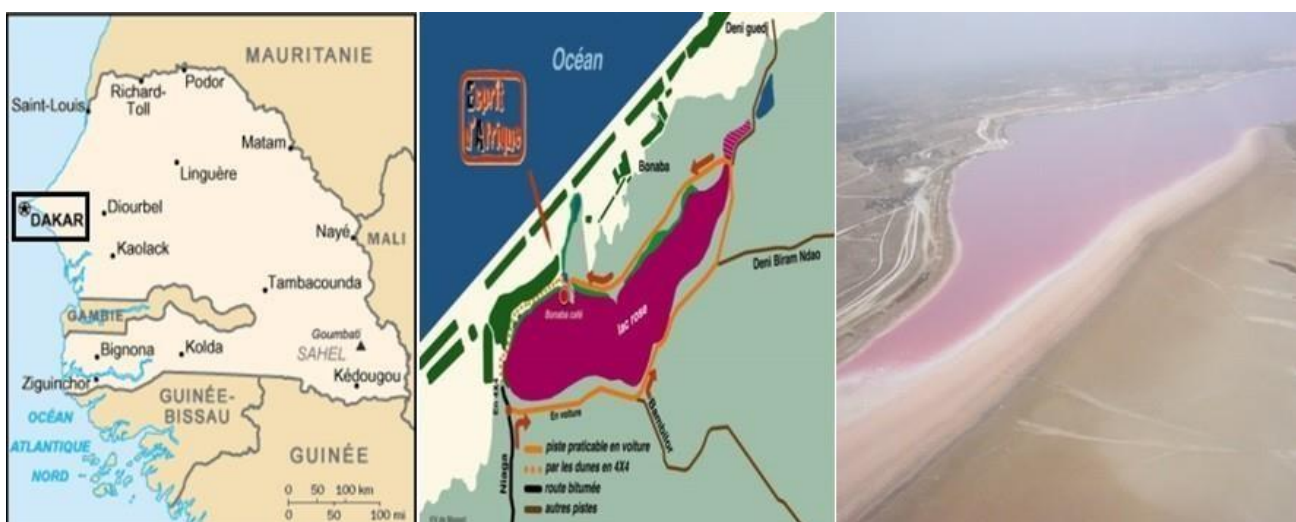
## FINDINGS

### The Pink Lake: Background, Salt Collecting Activity, By-Product Activities and Different Actors.

Located in Three (3) kms from the northern east of Dakar on Great Coast in Senegal, the lake Retba of Sangalkam village is a natural curiosity, famous by its Paris-Dakar rally's arrivals. "Lake Retba" in the local language means the "Pink Lake", translated from Wolof. At the origin, the lake Retba was not a Lake, but it was part of the Atlantic Ocean). Progressively, with the evaporation, a part of the ocean has stayed trapped between the Atlantic Ocean and a sand dune.

In the fifteenth century, the surface of the Lake was of 15 square kms but since, it doesn't stop diminishing and reaches today 3km<sup>2</sup> with a maximal depth of three meters (Sow, 2002). The evaporation too, has as affects a high increase of the concentration in salt, and this Lake, today, is threatened of disappearance due to its dryness, but also by the overexploitation of its salt. Indeed, the harvester of salt per year, what is enormous even if the lake is considered as an extreme place with around 380 to 400 g of salt per liter. The salt, in such a concentration, is particularly harmful to all living beings present in the lake apart from certain cyanobacteria's that have been adapted to the physical conditions of the environment. Besides, it seems that the high presence of this species (cyanobacteria, a microscopic animal) which gave to the lake its pink color (Lucie HUNOU, L. and TRISTAN, O.,2009).

### Localization



Source: www.bing.com

## The Salt Harvest Activity, A Multi-Scalar Process

According to an old man, a former administrator and sub-prefect in retirement, the name of the Pink Lake is Lake Retba, an haalpular name which stands for the big tide. For him, “the activity of women is a real operating. The job is very hard and not gainful”. The Lake is notably narrow, due to not only the evaporation related to the continued heats, but also to the pluviometry drop. The infiltration and streaming waters compose the Lake. In so doing, if the pluviometry falls, the streaming waters also go down. Today, it is bound to disappear.

The salt extraction activity follows a certain process with specific workers for each stage. Therefore, we witness a kind of gender division of functions. There are men who extract and gather the salt into the water and carry it to the river with pirogues. These men being at the head of the process must wake up very early (approximately at five am). Then, we have the “tibkat” who get on the pirogues to unload the salt in the bowls, women whose job is to carry it to a few meters next to the Lake to make it iodized. The salt is exposed there like sand hills or pyramids. There are also the retailers (“banabana”) who buy the salt of the collectors, pay to iodize it and for the packaging that is done by the “kolokolokat” and finally sell it to the wholesalers who export the salt to several countries in the sub-region (Mali, Togo, Guinea, etc.).

This gender division of labor at the lake traps women in a subordinate position compared to men. Although they derive income from their business, they are mere service providers while men who are responsible for the first collection earn more by selling directly salt to resellers. The reseller business is also practiced almost exclusively by men. We have identified only two female resellers, and they are not from the area. One of them is a “baol-baol”<sup>[5]</sup> and the other is a foreign and she come from the sub-region. Even men who are responsible for bagging and truck loading earn more than women who only rely on their labor to earn money. Far from satisfied with their work nevertheless paradoxically they do not show any form of protest.

So, there is a lack of proportionality between drudgery and financial resources they draw. The proof is that many of the women interviewed consider their activity difficult and low rewarded. Through their words, one can easily understand that they have no other recourse than the lake.

Women’s discourse analysis and observation have also allowed us to see that their work is uncertain, unstable, and periodic. Indeed, women are operational only during the collection phase. Once the collection was complete, they are excluded from the process. This periodicity and seasonality of their work reduce their level of participation in meeting the needs of their households.

## White Gold into the Water

In fact, the harvest method is very basic. Once in the depth of the Lake, the diver gets out of his pirogue with an instrument called “djodj”. The harvest is done by that instrument. The head being out of the water, the collector then dive this instrument to break the salt piles. “Salinity is so important that it is unimaginable to put one’s head in the water to avoid the contact of the salt water with the eyes”, specifies S. D., another collector.

Collectors are also exposed to many injury risks. “Blood become very fluid due to the salt. Doyen Amadou Sow does recommend to strictly avoid all gaping wound that would make blood flow continuously”. He also advises” to put closed shoes and long socks”. When the piles are broken, the salt is collected with a sifter and a shovel before being piled up in the partitioned barge. According to the results of the collector, such a job may last between 3 and 4 hours. Then he can join the bank with his cargo that almost amounts to 1.4 tons.

Among this collected amount, four bowls of salt are taken off to legally belong to the boatman. The pictures

below show a working collector. The image visibly demonstrates the two main stages of the collecting process.



Source: picture taken by the author

The job of “kolokolokat” is exclusively reserved for men. But this has not always been the case. Indeed, at the beginning, women practiced this activity, which is the first phase of the salt collection process but according to the Lake workers this task was too hard for women. In addition, it caused them huge health problems. Some women explained that’s the reason why we often see women’s abortions in the Pink Lake. Progressively this idea took hold in the minds of workers and finally tacit measures have been taken to prevent women from entering the lake. This is what makes that there has been a reorganization of women’s role in the process: now they are only responsible for unloading the canoes. The cantonment of the women’s role reduced their incomes since the sale of salt from the collection is more profitable than a simple discharge equally laborious and uncertain. After all, this prohibition has failed to prevent contact of women with salt water. The discharge of salt often requires the entry of women into the water and thus exposes them to the same hazards we wanted to avoid them excluding them from the salt “pre-collection”. Eventually, one can ask if this gendered labor division in the Pink Lake aims to protect women against diseases and abortions than to exclude them from a part of the salt exploitation process which is most remunerative. Thinking it over, the second option is most defensible.

Therefore, we can say that the sexual division of labor at the lake is more guided by socio-cultural representations than by reasons related to the exposure of women to the risks inherent of their work. Indeed, in Africa in general and in Senegal in particular, the most “trivial” tasks and often less remunerative are reserved in many cases to women. In the case of the pink lake, we can say that female participation is only insignificant in this way that it doesn’t yield enough money, but as far as his importance in the collection chain and its painfulness are concerned, it is far from being trivial. Finally, one concludes that what happens at the lake is only a subtle transposition of what is generally experienced in the Senegalese society where women are engaged in free labor or poorly paid. This is because we essentially recognize to woman more a reproductive role than a productive one. If Africa, women have been for a long time playing a productive role (farm work, household chores, for example) beyond that of breeding (childcare, maternity etc.), it should be noted that this work was not paid. This is reinforced by the colonization which has raised the wages in which women have long been excluded. Moreover, in its infancy, schooling in Africa has prioritized boys to the detriment of girls. And this has had an impact on the types of work assigned to them and the income they earn. These disparities between men and women in terms of pay are also explained by the difference in social status between the two categories. Socially and even culturally, we recognize the man responsible for meeting the household needs (daily expenditures, protection, housing, health etc.), while the women participation in meeting these needs is free and optional. Therefore, what explains in part the fact that men earn more than women because they are supposed to have more burdens and



responsibilities. But in a context where we have women managing a household and women who participate indispensably to the survival of families, the legitimacy of such discrimination in favor of men remains subjected to critical review.

In the Pink Lake, there are women who are heads of household and women whose household survival depends on their work for subsistence. But the pay differential does not favor the effective participation of women in their household's needs satisfaction.

Mr M.W. a local tourist guide, makes a description of the salt collecting activity by mentioning a little bit its historic and the changes occurred both in the nature of the Lake (surface, quantity) and in the job planning. The rule box below obtained through an interview with Mr. Wane gives us a global view of the salt exploitation. His opinion somehow shows an informal or tacit planning of the salt collecting activity, but which is very structured. Indeed, there are accepted standards (legally recognized) by the workers in the Lake and there are also decreed sanctions in case of infraction.

### **The Exploitation of the Salt in Lake Rose, A Threatened Activity?**

With an average of 24. 000 tons of salt extracted each year, is The Pink Lake bound to disappear at long, as feared by some scientists? For this question, the answer of a chief of the Lake is the following: "it is a wrong problem. People who frequently go to the Lake better know what it is about. At the contrary, the salt exploitation regenerates the sand". According to M.N, the General Secretary of the Pink Lake's Management Committee, the pink color of the Lake which tends to change is not due to the disappearance of the salt. "It is the high pluviometry that makes the Lake less and less pink, like during the past wintering", he says. This opinion is common to the interviewed workers in the area. "Also, it's the abundance of pluviometry that impedes the salt to crystallize like before", explains P K G, a "coxeur". "Since twenty years, it's only in 2015 that we find such an important quantity of water like this year", he affirms.

This abundance of pluviometry also causes the change of the color of the Lake which more and more turns to ochre, explain our interlocutors. As far as the collectors are concerned, the job thus comes to be easier. In the place of the salt piles that are difficult to unstick, the salt appears in a granulose form into the water. This has developed much anxiety concerning the operators at the beginning. But the analyses made in the laboratories of the capital city (of Dakar) have demonstrated that the salt quality did not change at all.

Four days after its harvest, the salt piled up on the river can be now sifted to pull off the possible rubbish that may be mixed in it. Also, it is compulsorily iodized before being packed for sale. A rate of 80 to 90 ppm of iodine is necessary for the salt sold in the local market. For the exploitation, this rate is 100ppm, "in order to allow having a minimum rate of 80 to 90ppm with the wastage caused by the travel lasting", justifies D.K. chief of the village of Virage site.



Iodization units and already iodized salt in bag, pictures taken by the author.

To fight against goiter, UNICEF (United Nations Children's Fund works for children's rights, survival, development, and protection) helps the operators in the perfection of methods to iodize the salt which achievement conditions that have very notably been improved thanks to machines implemented in the area.

For D.G., "if there is not enough rain, the layer would not be full and therefore there would not be much water in the wells, and this will affect the agricultural activity. There is also the fact that many farmers will sell their fields to survive".

At the beginning of the operating (April, May, June, July), almost all the women work but when the rain begins to fall, many of them leave the activity because it tends to be less profitable. Then, after a few years of work these women redeploy themselves to the business of "antique seller". The activity of salt is very hard and is not enough profitable. These words come from a woman "antique seller" who sustains that "our activity is not difficult and allows us to survive." "Compared to the activity of women carrying salt, our job is very noble, it is soft".

### **The Salt Exploitation, a Well-Organized and Controlled Business by the Management Committee**

Before the creation of the management committee, the salt operators suffered from the dishonesty of many traders. "Some merchants used our commodity for two months before returning to pay us. Others who bought it on credit for reselling it in the sub-region countries never came back to pay debts", remembers A. S.

In those days, the 50 Kg's bags of salt were sold to the merchants for 125Fcfa on average. "During a hard period, merchants came to make prices fall up to 35Fcfa added the fact that some of them went with millions of Francs that belong to the operators in the Lake", argues the secretary-general of the management committee, composed of 18 members. The particularity of the salt dealing is that it is mainly intended to exportation. Until now, more than 90 percent of the Pink Lake output is exported to countries like Ivory Coast, Mali, or Burkina Faso.

Operators began to be aware of this exploitation they were in early 90s. Today, with the help of the management committee, the trend has changed a lot. Workers are now paid before the salt leaves the surroundings. Better, the bag is not only sold for 800Fcfa but also such shady practices are almost impossible. From extraction to merchandizing, the committee controls everything. "The loan has been banished and every operator who has an order must immediately notify it to the management committee which endorses the agreement", explains its secretary-general. A floor price is set to 13, 100Fcfa for each ton and can increase up to 28, 000Fcfa at certain periods of the year, says MaguetteNdiour. A commission of 25Fcfa is taken from each bag of 25 kgs. It is in the charge of the merchant also called supplier. Because there are, on average, between 280 and 300 tons of sold salt, on the Lake area, in full working period as between January and June, small returns are cashed by the management committee. "This grant finance us many infrastructures of social vocation to the benefit of rural surrounding communities", explains Maguette. When he got his degree in 1992, this former pupil of Abdoulaye Sadji high school of Rufisque never planned to go at university. "My father was a new pensioner. I had student friends whose living conditions frightened me. I immediately released that I had to look for a job and I thought about the Pink Lake site where my uncles were already working", he tells.

After trying the job of antique-seller for two years, Maguette launched into salt business in 1994. "I have experienced everything here. From the job of "kolokolokat" to that of collector before occupying the function of secretary-general of the management committee, I do not regret the way I have followed", he ensures. Bigamous and father of three sons, Maguette likely compares the salt to white gold. At certain periods of the year the business can seem flourishing. Moroseness is normal for others. The situation was

worse than during the politico-military crisis in Ivory Coast. Usually, the wintering is the weak period for the workers in the Lake. “We do not see customers”, he argues.

On the other hand, the output evacuation also causes troubles to the operators. The availability of containers, necessary to the interior waterway exportation, is not always ensured. “Only two local marine companies accept to carry the salt. It is usual to wait for two months at the port to have one’s commodity crossing the sea”, he regrets.

This data show that the management committee institution is induced both advantages and “perverse effects” [6] to salt diggers at the Pink Lake. The management committee facilitates indeed the salt selling and protects the salt collectors against eventual swindles, but it subjects them to a most constraining control. But they deploy strategies to jugulate this system rules altogether coercive [7].

### Women and the Profession of Antique-Seller

The profession of antique-seller is a job that is enough developed in the Lake. Mainly, it can be found in the surroundings of the Lake and in the craftsman village. But we will pay attention to the women antique seller based in the Lake. These women who sell mostly hand craft products have as customers tourists who are mainly from the Western World. They are usually payed with euros but there is always someone whose job is to make the change from euro to franc CFA. When tourists arrive, we can hear them saying “lady take me a picture”, “come here”, “would you like to have a gift”. All these expressions aim at selling few items or tying relationship with tourists. Also, women write their names, addresses on piece of papers that they give to tourists. These are like visiting cards. This enables tourists to identify women when giving them gifts. It’s a regular practice even though it’s uncertain. That’s to say it is not sufficient to give a gift to benefit of the tourist aid. It’s a long-term investment. One of the women explains: “you can give only one piece of paper and receive gifts, but you can also give 200 papers without receiving any gift”. This is the reality, but we always give them since it does not cost anything”. It’s a relatively easy job compared to that of a “coxer”. Women usually suffer from discrimination in the benefice of the hotel keepers. Tourist guides often prevent their customers (tourists) from buying women’s items and ask them to wait. Women are sometimes humiliated by tourists.

These pictures are an exhibition of antique-sellers in action.



First Picture (taken by the author);

Second picture (www.

**Table 1:** Evolution of salt exploitation in the Pink Lake /reference period 2005-2014

Years	Output in tons.
2005	38420
2006	30510
2007	40454
2008	39140
2009	44125
2010	39160
2011	29833
2012	24067
2013	37860
2014	42165
Total output of the ten last years	365734

Source: Management committee in Lac Rose/2015

The above-mentioned table indicates that the salt production at the Pink Lake has evolved by jeks and jumps from 2005 to 2014 with a maximum production of 44,125 tons achieved in 2009. In 2014 also the salt production was quite significant. The years 2006, 2011 and 2012 were marked by a considerable drop in the salt production. This lack of salt production consistency is related to the rainfall variability. So, the exploitation of salt, like agriculture, livestock and fishing activity is tributary of climate change. Indeed, a relatively high rainfall fills the lake and increases the amount of salt. Conversely, too low rainfall causes a narrowing of the lake and a diminishing of the salt quantity available when too high rainfall makes difficult the salt crystallization and reduces the quantity. But also, there are other factors that determine the salt productivity particularly the temperature.

### **The Activity of Salt Collectors as Dynamics of Participation in Development**

As far as this part is concerned, it's about, via the observation in situ and the interviews, analyzing how women collecting salt in The Pink Lake, by revenues generated by their activity, reinvestments in other sectors that come from this one, communal outcome of their activity, etc., participate in development or represent development agents. The limits of such participation have also to be shown here.

### **Women as development agents since they represent an important link in the extraction and marketing chain of the salt.**

The gender problematic is very large, it includes several approaches. But, in this part, it's about interrogating only the Gender and Development (GAD) approach as it is more related to our subject. A lot of studies and reports of international and regional institutions as the World Bank, the United Nations Organization, FAO, CODESRIA and so, established the link between Gender and development in particular economic growth and productivity.

It's in this context that one should understand one of the World Bank reports [8] revealing that Africa get growth reserves buried in its men largely, and particularly in its women who, nowadays, provide for more than the half of the manpower in the continent but don't have the equal access to education and production factors. This same report showed that women receive only 1% of the credit devoted to agriculture. We should add to this the fact that women are missing, weakly represented or occupy an eccentric position in

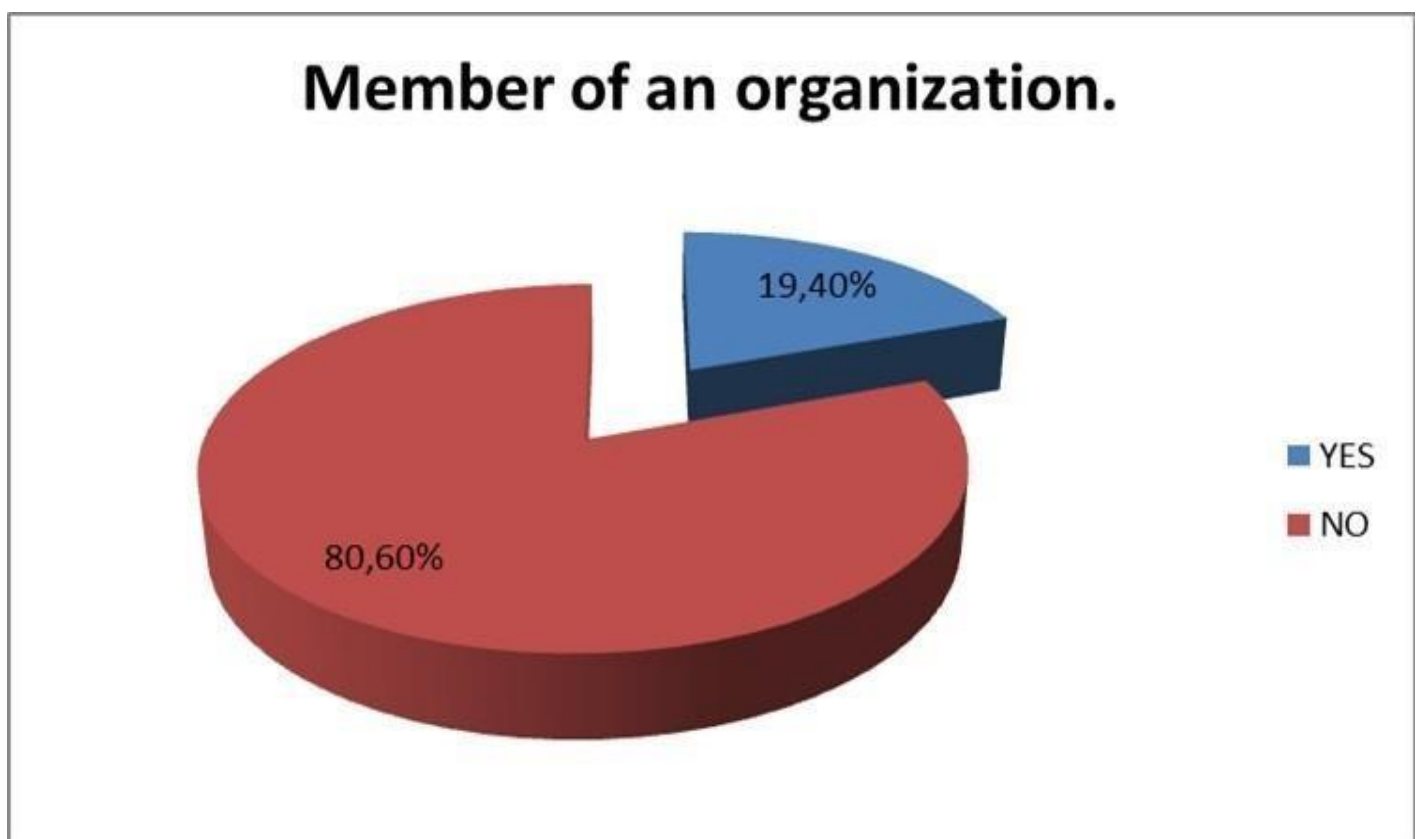
decision-making authorities. They get a weak control of their work product comparatively to men. Most of the incomes they earn are used to supply their households' needs such as food, clothing, health, education, and women spend much more time to work than men. We can add stress due to housework, differentiation in the remuneration among other factors which sap the women' participation to development. Therefore, gender equality can be effective for poverty reduction and for the African countries' development.

For the case of our study, we will analyze women participation to development through the salt collecting activity and constraints they are confronted with.

Thus, we must describe the functions of women in the exploitation and merchandizing of the salt. The objective is to demonstrate that women are unquestionable actors in the salt exploitation process in the Lake and this being so, they participate in the local development of the surrounding communities in the Lake. Indeed, beyond the personal profits given by their work, women participate in the revenue issuing that serve to build local infrastructures. So, even according to their sayings during the interview's women show a lack of community service, they nevertheless play an important role in development. Such refraction to all local activity can also be seen at the associative stage. Indeed, they are not numerous the women who are members of an organization.

The following table shows the women participation level to associative dynamics.

Graphic 1: Organization membership



Source: author's fieldwork/2015

Ruling activities are directly assumed by the management committee of the Lake that has the responsibility of dispatching the funds generated by the salt exploitation. Thus, women involvement may seem indirect but is of a great importance. The following pictures help to understand women's functions in the salt gathering chain.



Women unloading a bowl of salt: pictures taken by the author.

This activity (salt transportation) is exclusively done by women; it is very difficult and a little bit profitable.

The following table shows the variable relating to hardness of the work and the variable informing on the profitability of the activity. The overall shows that globally women’s work is perceived as very difficult and uneconomic.

Table 2: Hardness and profitability

perception of women’s work: Hardness/Profitability	Very profitable	Profitable	A little profitable	Not at all profitable	TOTAL
Very difficult	0	5	41	8	54
Difficult	0	4	9	1	14
A little difficult	0	0	4	0	4
Not at all difficult	0	0	0	0	0
TOTAL	0	9	54	9	72

Source: author’s fieldwork, 2015

It is a stage of a so long and sophisticated process that Mr.W.D. a local tourist guide stresses in these words: “hundreds of people practice salt extraction. Men, into the water up to the chest and the body coated with shea-tree butter to protect their skin from corrosive salinity of the waters in the Lake, break with a peg the crust of salt located inside before gathering it with a shovel and filling the pirogues that can contain one ton and half. Once the pirogues are filled, men go back to the bank where women unload the product. The salt is piled up in the surroundings for drying and whitening it in the sun”.

Women use bowls and they carry them from the pirogues to the piles. Men are called “coxe”. Each “coxe” has a collector to unload for him. Women arrive at 11:00 at the working place and wait for the collectors to get out of the water to start working. When the pirogues are settled near the Lake, women start working. Each woman needs a “tibkat”, someone who fills the bowl and helps her to put it on a head. Generally, “tibkat” are men but women also can regroup in binomial, what allow them to alternate between the salt transportation and the filled bowls. Some women make groups of about three or four persons and work on an assembly line. In this case there is a woman who is responsible for the filling of the bowl, another one pulls it off the water and puts it in about three meters far, another one carries it 5 meters far and another is at about 4 meters near the pile to discharge the salt. They alternate their position to avoid penalizing somebody

in the group. Then, they share incomes into equal parts. They receive 25Fcf for each bowl and 750Fcf more for the “tibkat”. Their revenues are not steady; they depend on the campaign harvesting period, the quantity of salt in the Lake, the work force, the endurance, etc. But they globally earn between 1.000 and 3.000Fcf per day. For some women and even some men in the Lake, this is a pure exploitation. It is the case of an old man, ex administrator, sub-prefect in retirement who argues that “the job of women is a real exploitation. They are working hard and are not well paid”. There are resellers among them, but they are the minority.

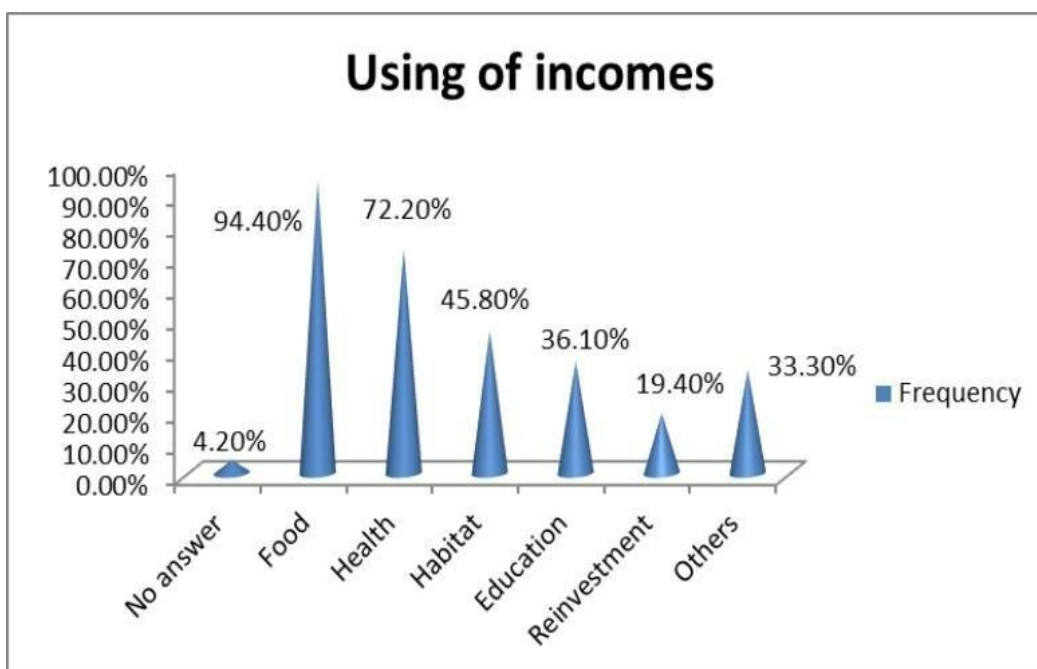
Working in association with the management committee shoveling man paid for 400Fcf, the working women in the Pink Lake are called “coxeurs”. However, their profession has nothing to do with that of a “coxeur” in public transportations. Th. G. is one of the “coxeurs”. She lives in Niaga village, and recognizes They unload the salt in the pirogue for 600Fcf. She says that “she was born in the Lake, has grown up in the Lake, and is working in the Lake”. When the job becomes profitable, she can daily gain 1.800Fcf, the revenues of three unloaded pirogues. But that is exceptional. “It is the maximum I can do. Beyond, it is physically unsustainable”, confesses this very dynamic lady and who speaks lébou [9] quite like a native.

In the past, one even could see women collecting salt in the Lake by themselves. Now, such a practice is not possible. They were prevented from collecting salt since people noticed that it is a very hard activity for a woman because it causes them health troubles. However, according to the secretary general of the committee, these hypertension and abortion risks are not well known. “Some women are working until the eve of their birth”, he says.

**Women, as development agents, are the support for the satisfaction of household basic needs.**

The revenues coming from women’s activity is mainly used to satisfy the needs of their household. These are food needs (food purchasing, increasing of the family expenditure), habitat needs (rent payment, land purchasing and building), health needs (consultation and medical care), education (requisites purchasing, payment of school fees, the children transportation), clothing, reserve for the ceremonies (tabaski, baptism, wedding). The analysis of quantitative data has shown the main needs that are satisfied by the women transporting salt.

Graphic 2: Using of incomes



The reading of this graphic shows that the bulk of the income generated by women's activities is used to meet the basic social needs such as food (94.4%), health (72.2 %), housing (45.8%), education (36.1%) and other social needs represented by the "other" category. These needs are clothing, participation in ceremonies (weddings, baptisms, etc.), contributions in the tontine (tuur) etc. Few women or 19.4% use the money they earn to reinvest in other income generating activities. This constant thus indicates that women of the Pink Lake are included more in a logic of necessity or satisfaction of urgent needs than in a logic of wealth creation. They consider the activity as a means of livelihood for low incomes derived from them that it does not achieve much.

These words from Kh. B., a 40-year-old woman, salt carrier in the Lake (October, 30<sup>th</sup>, 2015) give not only a clear understanding of the women's activity, its revenues and its outcomes but also mention the related risks.

I started working in the Lake since the coming of the "moors" (1989). We are working in the Lake to earn our living. The job is extremely painful but if you work until the afternoon, you will have money to satisfy your needs ("fadji say sokhla") because we are women and we are working. We earn 25Fcf for each bowl. Sometimes, the pirogue can contain 60 bowls and you can earn 1.500Fcf plus 700Fcf for the one who fill the bowls for you ("tibkat") and you have 2.200Fcf in total. After, this total is divided by two and everyone has 1.100Fcf. If there is salt in the Lake, we earn up to 5.000 or 6.000Fcf a day. I was not born here; I was born in the Gambia. When I came in Senegal, I did commerce for five years, but I stopped later to come to work in the Lake. My family lives in Mbeut near Bambilor. I use the money I earn here to help my family and my sons specially. I feed them and buy clothes for them with the money I earn here. My husband also is working here in the Lake. If my husband earns money, he helps me satisfying my needs, if he doesn't have money, I manage with my own resources. I share all what I gain with my family, we live our live, what matters is that the others do not know our problems. My husband was a cattle-breeder and was selling cattles in "Seras" (a local meat market in Dakar) but he stopped to come and work in the Lake. We have great difficulties; the Lake is very risky. Sometimes, women working in the lake have abortions and that is due to the heavy bowls we carry. Sometimes, we also move, and we spend much money for this.

Through this speech, which is quite recurring in women pink lake, one can understand what the development means for them. They summarize almost everything in the term "FADJ SOXLA" which, literally translated, may mean "solve one's problems" or "meet their needs". Indeed, what interests them is less wealth accumulation in an "economistic" perspective than the needs of any kind. But because of the meager resources they earn, they only want to meet the most urgent needs such as food, health, housing etc. Even at this level, it should be noted that most often women can't alone ensure the satisfaction of their household needs. They are much more in a logic of participation. They do not seem to claim an empowerment compared to men, they are rather in the pro-action and recognize the authority of the husband as head of the family but also the first guarantor of economic and social security of the household. So, their activity enables them to contribute in the same way as the husband and other family members to the satisfaction of family needs. The proof is that some women say they are working in the lake to help their husbands. This means it is up to the latter to provide survival means for the household but in a context of crisis and insecurity the sexual division of roles etiolates in favor of a certain hybridity in the division of roles. This testifies to the socially constructed nature of the category's "men", "women" and the roles they are assigned. How can one explain, for example, the fact that it is women who unload the salt while some men are responsible for lighter work as iodization and bagging? This leads us to say that the division of roles in the salt collecting and marketing process, contrary to what believe some gender analysts, is explained more by Socio-economic factors than by the biological-physiological difference between both categories.



## **Women in the Pink Lake and climate change. Salt exploitation as resilience activity to the effects induced by climate change: the rainfall as a backbone of the explanation.**

Resilience is a paradigm that is a continuation of the vulnerability paradigm. It calls for an interest in greater or lesser ability of a society or a system to “cash in” the event (resistance) to manage the possible resulting crisis and to regain “normal” operation, relatively close to its initial state (resilience). But it also implies taking into account the most ordinary situations (Gaillard, 2006, 2007) as the uses and management of space, policies or decisions affecting risk management (Becerra and Roussary, 2008; Cartier, 2002). Resilience is defined as the ability of a system to develop strategies to initially resist the effects of adverse endogenous or exogenous factors and then try to return to its original state. So, there are two dimensions of food security: the resistance or adaptation and the “bounce back”. That all exposed system can either develop defensive strategies or offensive strategies [10]. For Adger, « resilience refers to the magnitude of disturbance that can be absorbed before a system change to a radically different state as well as the capacity to self-organize and the capacity for adaptation to emerging circumstances » (Adger W. N., 2000). It is important to remember, however, that women are not vulnerable to climate change, but they are also effective actors or agents of change in relation to both mitigation and adaptation. Women often have a strong body of knowledge and expertise that can be used in climate change mitigation, disaster reduction and adaptation strategies. Furthermore, women’s responsibilities in households and communities, as stewards of natural and household resources, position them well to contribute to livelihood strategies adapted to changing the environmental realities [11].

In the case of our study, we consider the salt exploiting activity as a resilient practice and women as resilient actors, trying to, through the incomes they earn, jugulate climate change effects.

Women are not sensitized at all and lack information as for climate change is concerned. Some of them say that they have never heard talking about climate change. Others, who sustain the contrary, do not really know what it is about. They make a great confusion between climate change and weather, a confusion which even concern people of a high level of instruction. Here are the various definitions that women gave to climate change: “Climate change means alternating between cold and heat, sometimes there is wind”; “You see how it’s hot today, sometimes it’s too cold”; “It’s climate change brings diseases like the common cold”; “Sometimes it’s cold and it’s not good for health”; “Sometimes also it’s hot and it’s not good for health”; “If it’s hot, we have problems, if it is cold, we have problems too”; “Sometimes the climate is cold, sometimes it is hot”; “Climate change is the climate”; “Sometimes it’s hot, sometimes it’s cold”; “Climate change is the cold.”

However, this does not mean that women are not concerned by this phenomenon. Indeed, as said above, the omnipresence of climate change makes that almost all the people feel its effects whether they are conscious or not. This is exactly what happens with our target. Indeed, the rainfall drop, one of the aftermaths of climate change, has an impact on the level of the Lake and consequently on the existing salt quantity. This has direct incidences on the salt total production and then on the incomes of women who depend on its unloading to earn money for the satisfaction of their needs. Thus, if there is sufficient rain, the Lake is fed by the infiltration and streaming waters. On the contrary, if the level of rainfall is low, the Lake is less full and this combined with evaporation, considerably decreases the quantity of salt. Also, we must notice that an excessive quantity of rains impedes the solution (the water of the Lake) from being saturated and consequently the salt crystallizes more difficultly, and the production may decrease.

This clearly shows that even if women can know and explain it, their activity is often done following the changes of the climate. Also, we must notice that the pluviometry drop in the area has deeply affected the agricultural sector both in rainy season and in dry season. Indeed, for the rain activity, the water shortage has incidences on the quality of the gathered product and the quantity (production and productivity drop),

stocks and the purchasing power of the agricultural housekeeping are bent, and this consequently encourages some women to redeploy in the salt exploitation.

There are workers in the Lake (collector men mainly) who are obliged to redeploy in the salt exploitation or practice this activity in a rotary way, they profit from certain periods or free time to work in the Lake and return to the agricultural practices if necessary. So, the salt exploitation is an accommodation activity during these moments.

Also, we have noticed that the decline in rainfall affects the agriculture in dry season through a drying up of the layers. You must dig more deeply to reach these layers and such a situation discourages many farmers and pushes them to look for other options among which the salt exploitation.

The lake is therefore a space of resilience and adaptation for populations experiencing enormous difficulties. But it is also clear that this resilience means is paradoxically vulnerable because of overfishing and variability in rainfall due to climate change. It is in this sense that we must understand this about Pape Sow: “Seen as such, the lake can be defined as a “chronically vulnerable area”. The variability of the resources (water evaporation for example) on the site is likely to undermine, in the long term, human security by reducing access to the salt mining activities which are central to stable and sustain livelihoods” [12].

Table 3: Heard of climate change

Have you ever heard of climate change?		
Heard of climate change	Number.	Frequency
YES	18	25,0%
NO	54	75,0%
TOTAL	72	100%

Source : Author’s fieldwork/2015

Data about the level of awareness of women in relation to climate change show that 75% of women surveyed said they had never heard of climate change against 25% who claim the opposite. This therefore shows that women’s level of information is very low. The second table shows information on women’s ability to define or say what it is climate change; it indicates that 68.1% is made up of non-response. This is since many of them have not even once heard about climate change. Therefore, they cannot know what it is.

This can be explained by their enrollment rate is very low (see table). This is shown by the following table which correlates the level of education and knowledge of climate change. It indicates that 64 of the 72 women are enrolled and 50 of these women have never heard of climate change. Women who have a level of primary education are 7 in number and among these 7 similarly, 4 say they ignore what is climate change. This table indicates that 4 of the 8 educated women know what climate change is.

The other aspect of the climate change to be known for it has an impact on the salt collecting is linked to the persistent heats. Indeed, during the dry season and a few times after wintering, it is excessively hot in the Lake. This makes the collectors work much more difficult and exposes them to illnesses like general tiredness, headaches, etc. We can also mention the regular faints of which they are victim.

## DISCUSSION AND CONCLUSION

The objective of this study was to demonstrate how women of the Pink Lake are development actors

through the salt collection activity in a context marked by climate change and its dramatic effects. Thus, we first tried to explore the historical (contextual) and theoretical contours of our object. To do this we have divided this theoretical part into two angles. First the evolution of thinking of climate change concerns and different approaches to it. Then we asked the women and development report by revisiting the theoretical approaches on women. Finally, we established the Women and Climate Change link. This theoretical work has allowed us to ask the following research question: how the activities led by women that extract salt in the Pink Lake do raise participative dynamics to development in a context marked by the flowering of different obstacles related to the climate change? To answer this question, we have developed the following hypothesis: In a climate change context which has made difficult or impossible the traditional practice of agriculture, breeding and fishing, women of the Pink Lake, through the salt extraction, develop practices of resilience which contribute to their locality's development. It is this assumption which we used as a guideline throughout the study. To test this hypothesis, we opted for a triangulation of qualitative and quantitative methods with the following collecting tools: the questionnaires, the interview guides, the sociological observation, life stories and documentary analysis. Considering the investigative work, we realized that our theoretical constructs are partially confirmed by the survey data. Indeed, the survey shows that women, through incomes from their activities, supply some of their households' needs such as food, housing, health, education etc. They also contribute to the development of their community because playing an essential role in the salt collecting and marketing process of which part of the income is used for the building of community structures (mosques, schools, homes etc.). But the participation of women in development must be shaded to the extent that they are much more in the subsistence economy. The incomes from the activity are too modest to allow reinvestment in other income-generating activities. The survey also revealed that women's activity allows them to adapt to climate change as constituting recourse in a context where agriculture and livestock, as main activities of Sangalkam area that houses the Pink Lake are threatened by climate change (declining rainfall, drying up of groundwater etc.). However, women's activity is less resilience than mitigation in relation to climate change because resilience implies a certain degree of knowledge with reference to exposure to a given risk or women in the vast majority are not aware of climate change and its effects. The qualitative results reveal an insignificant number of women who know what climate change is. This does not mean that the salt collection activity is not a climate change adaptation. Indeed, the study showed that a great number of men and women are converted to the salt harvest because they can no longer exercise their traditional activities due to climate change. But it's clear that the lack of information on climate change reduces their capacity to adapt because as Frankhauser thinks it « *Successful adaptation requires recognition of the necessity to adapt, knowledge about available options, the capacity to implement the most suitable ones* ». (Ibid., page 896, Frankhauser and Tol, 1997).

We met some difficulties particularly in the data collection step. These difficulties are related to the availability of women since the survey coincided with a period where some women were present at the lake. Because of women's illiteracy we were required to translate our questions in Wolof. Thus, the study includes theoretical limits, and methodological insufficiencies related to results.

Data obtained through this study are interesting in the way that they put the light on women's activities as strategies to adapt to climate change effects. They allow at the same time to understand that women tasks constitute a significant link in the chain symbolizing the development dynamics and the valorization of women's initiatives and women's empowerment could be an effective way to overcome extreme poverty and achieve the quasi-secular goal of developing African countries mainly those in the Sahel. However, they are less to be taken as gospel words than to criticize, to improve and complete. If they allow to understand the relationship between women, climate change and development from the experience of the Pink Lake, the fact remains that they have left unresolved other aspects of the problem which are all as important for its elucidation. This document is therefore a premise for reflection that is more complex and therefore opens enormous opportunities for research and action we make below in the form of questions.

- What is the scope of women's action on climate change adaptation?

- How to achieve the development goals set by the Sahelian countries like Senegal in a context marked by the omnipresence of climate change and its harmful effects?
- How to combine protection / preservation of the environment and exploitation of natural resources such as salt at the Pink Lake?
- What should be the role of local authorities in these contradictory challenges of environmental conservation and exploitation of natural resources in the context of implementation of the 3<sup>rd</sup> Act of decentralization in Senegal?
- What policies does it require to better impregnate women on the climate change issues?

These are among other issues that one can ask legitimately at the end of this study.

## BIBLIOGRAPHY

1. Nasa Scientist: Global Warming is Nonsense, May 1, 2014
2. Famine Early Warning System Network (Fews Net) Patrick Gonzalez U.S. Geological Survey (Usgs) January 3, 2002
3. Vandana Shiva, "Development, Ecology and Women", In: Momsen, Janet (Ed), (2008), Gender and Development. Critical Concepts in Development Studies, Vol. 1, Pp. 279-289 (Reprint From 1989).
4. Climate Change 2001-Ipcc Assessment Report
5. Ozer P., Erpicum M., Demarée G. Et Vandiepenbeck M. (2003) – The Sahelian Drought May Have Ended During The 1990s. *Hydrological Sciences Journal*, Vol. 48, N° 3, P. 489-492. Doi: 1623/Hysj.48.3.489.45285
6. Brooks N. (2006). Changement Climatique, Sécheresse Et Pastoralisme Au Sahel. Note De Discussion Pour L'initiative Mondiale Sur Le Pastoralisme Durable, 12p.
7. Brooks H. And Leslie R., (2005). Resiliency in the Face of Disaster. *Science*, Vol. 309, Special Section. [En Ligne] : [Www.Sciencemag.Org](http://www.sciencemag.org).
8. Bouzou Moussa L. (2000), Gestion Des Ressources Naturelles Et Evolution Des Systèmes Agraires Dans La Région De Maradi, Working Paper 28, Drylandsresearchcrewkerne, Somerset, Royaume-Uni, 32p.
9. Abdou Amadou A., (2009), Perceptions Paysannes Des Changements Climatiques Du Sahel Et Stratégie D'adaptation : Cas Des Agriculteurs.
10. Gerard M. And Al (2008), "Modelling the Biogeochemical Cycle of Silicon in Soils: Application to a Temperate Forest Ecosystem", *Geochimica Et Cosmochimica Acta* volume 72, Issue 3, 1 February 2008, Pages 741–758
11. Abdou A., Thierry L. Et Abou A. (2008). Signification Et Usage De L'indice Pluviométrique Au
12. Sécheresse, Vol. 19, No 4. Pp: 227-235.
13. De Payrefabregues (1990)
14. Hulme, M., Conway, D., Kelly, P., Subaks, S., Dowling, T. 2001. "The Impacts Of Climate Change on Africa". Centre For Social and Economic Research on The Global Environment (Cserge). University Of East Anglia and University of Oxford. Oxford.
15. Mvk Sikakumar (1992)
16. Ozer P. Et Erpicum M. (1995). Méthodologie Pour Une Meilleure Représentation Spatiotemporelle Des Fluctuations Pluviométriques Observées Au Niger Depuis 1905. *Sécheresse*, No 1, Vol. 6.
17. Paturol J. E., Servat E., Kouame B., Boyer Jean-François, Lubes H. Et Masson Jean-Marie (1995). Manifestations De La Sécheresse En Afrique De L'ouest Non Sahélienne. Cas De La Côte D'ivoire, Du Togo Et Du Benin, *Sécheresse*, No 1, Vol. 6, Pp: 95 – 102. Salissou A (2009)
18. Amoukou A. I., (2009). Un Village Nigérien Face Au Changement Climatique : Stratégies D'adaptation Au Changement Climatique Dans Une Zone Rurale Du Bassin Du Niger, Gtz, Abn,

- Niamey Nouvelle Imprimerie Du Niger, 95 P.
19. Bernus E. (1996) Le Pastoralisme Touarègue : Evolution Et Mutation? P 42-66 In Tubiana M.J., Luxereau A. Et Arditi C. Les Dynamiques Du Changement En Afrique Subsaharienne : Freins Et Impulsion: Paris L'harmattan, 1996(Bibliothèque Peiresec, 11).
  20. Issa B. Et Yamba B. (2009). Changements Climatiques Et Dynamique Foncière Dans Le Système De Cuvettes Oasiennes Du Sud-Est Nigérien. Revue De Sciences Environnementales. Université De Lomé (Togo), N°005, Pp: 51-62. Bernier X And Al (1994)
  21. Bernier B., Pare , Brazeau, Natural Stresses, Nutrient Imbalances and Forest Decline in Southeastern Quebec, Water, Air, And Soil Pollution November 1989, Volume 48, Issue 1, Pp 239-250
  22. Camberlin And Bertrando G.P. (1995)
  23. Thiaw Issa Laye, La Femme Seereer (Sénégal), L'harmattan, Paris, Septembre 2005, 282 P. (Isbn 2-7475-8907-2)
  24. Lazarev Grigori **Et Arab** Mouloud, 2003, Développement Local Et Communautés Rurales: Approches Et Instruments Pour Une Dynamique, Karthala, **Economie Et Développements, 14cm X 22cm,**
  25. Brody, A., Demetriades, J., Esplen, E. 2008. "Gender And Climate Change: Mapping The Linkages". Bridge, Institute of Development Studies. University Of Sussex. Brighton. Changements climatiques Et Femmes Agricultrices Du Burkina Faso, Rapport De Recherche D'oxfam, Juillet 2011
  26. Un Women Watch, (2009).
  27. Ka, Aminata. – Femmes Et Environnement : La Transformation Des Produits De La Pêche A Missirah (Région De Fatick). 1994, 50 P.
  28. Sall M., Samb A., Tall S. And Tandian Aly (2011), Training On Gender Manual On Gender And Climate Change
  29. Boudon, R. L'inégalité Des Chances, Paris, Hachette / Pluriel, 1979 (1ère Edition 1973), Pp. 106-113.
  30. Crozier M. Et Friedberg E., 1977, L'acteur Et Le Système, Edition Le Seuil.
  31. Tine Mor, Analyse De La Sécurité Alimentaire En Contexte De Vulnérabilité Environnementale Et Des Pratiques De Résilience Des Acteurs Locaux: Le Cas De La Commune De Ndiébène Gandiol Avec L'ouverture De La Brèche Sur La Langue De Barabarie, 2015, 131p. Mémoire De Master Université Gaston Berger De Saint-Louis/ Sénégal.
  32. 52 Session of The Commission on The Status of Women (2008) "Gender Perspectives Climate Change". Issues Paper for Interactive Expert Panel on Emerging Issues Affecting the Situation of Women or Equality Between Women and Men.
  33. The Status of Women (2008)
  34. Sow Papa, "Uncertainties and Conflicting Environmental Adaptation Strategies in The Region Of The Pink Lake, Senegal" Issn 1864-6638 Bonn, August 2012

## FOOTNOTES

[1] *La Banque Mondiale a commencé à s'intéresser au rôle de la femme dans le développement à la fin des années 1960 puis a fait une plus grande place à cette question dans son programme de travail dans le cadre de la décennie des Nations Unies pour la femme.*

[2] On doit enfin reconnaître que les dynamiques participatives resteront gravement compromises tant qu'on n'aura pas mieux tenu compte du rôle prépondérant que jouent déjà les femmes dans l'économie rurale et, en particulier du rôle qu'elles devront jouer dans les systèmes envisagés pour améliorer la gestion des ressources naturelles

[3] 52nd session of the Commission on the Status of Women (2008) "Gender perspectives on climate change," Issues paper for interactive expert panel on Emerging issues, trends and new approaches to issues affecting the situation of women or equality between women and men.

[4] Training Manual on Gender and Climate Change. Rep. IUCN, UNDP, Global Gender and Climate Alliance. Web. <http://data.iucn.org/dbtw-wpd/edocs/2009-012.pdf>

[5] Community situated in Diourbel region/Senegal characterized by entrepreneurship.

[6] Raymond Boudon, *L'inégalité des chances*, Paris, Hachette / Pluriel, 1979 (1ère édition 1973), pp. 106-113.

[7] Crozier M. et Friedberg E., 1977, *L'acteur et le système*, Edition Le Seuil.

[8] Alan Gelb, «Genre et développement : Un potentiel occulté en Afrique », Banque Mondiale, 2001.

[9] Ethnic group in Senegal

[10] Tine Mor, *Analyse de la sécurité alimentaire en contexte de vulnérabilité environnementale et des pratiques de résilience des acteurs locaux : le cas de la commune de Ndiébène Gandiol avec l'ouverture de la brèche sur la Langue de Barabarie*, 2015, 131p. Mémoire de master II Université Gaston Berger de Saint-Louis/ Sénégal.

[11] 52 session of the Commission on the Status of Women (2008) “Gender perspectives climate change”. Issues paper for interactive expert panel on Emerging issues affecting the situation of women or equality between women and men.

[12] **Papa Sow**, “Uncertainties and conflicting environmental adaptation strategies in the region of the Pink Lake, Senegal” ISSN 1864-6638 Bonn, August 2012.