Chapter 3

Understanding and Responding to Climate

Induced Water Conflict Risks over Transboundary Watercourses in West Africa

By Madiodio Niasse. IRD Institute de Recherche pour le Developpement; Regional water expert. Outgoing GWP West Africa

Contents

1. Abstract 76

2. Introduction 77

3. Diverging views on the likelihood of intensified conflicts over transboundary waters 78

4. West Africa context: Impacts of changing climate conditions on water resources 78
   4.1 Water interdependency 78
   4.2 Increased pressure on water 78
   4.3 Increased investments in water infrastructures in responses to changing climate conditions 79

5. Climate-induced tensions and conflicts over shared water courses 80
   5.1 Mauritania-Senegal: From risks of open armed conflict to the "thickening" of the border 80
   5.2 Ghana-Burkina: Suspicion and controversy over the causes of an energy crisis 82
   5.3 Adaptation strategies in Africa 82
   5.4 Niger-Nigeria: For or against the status quo in upstream countries? 83
   5.5 Cameroon-Nigeria on Lake Chad: Maintaining contact with receding waters 83
   5.6 Common patterns of conflicts risks in West Africa 85

6. Measures for preventing conflicts risks and for promoting cooperation over shared waters 85

7. Conclusions 86

1. Abstract

West Africa's climate conditions have significantly deteriorated in the last four decades, a period marked by a significant decline in rainfall and river discharges, and of accentuated seasonal and inter-annual variability. Since the early 1970s, the region's annual rainfall has dropped by 15–30%. The region's major rivers (Niger, Senegal, Volta, Gambia and Lake Chad) similarly experienced a decrease in average annual discharge in the order of 40–60%.

Although climate predictions for West Africa vary significantly depending on the models used, no improvements in climate conditions are expected, and in many scenarios, hotter and drier conditions are predicted with a higher frequency of extreme weather events. Governments respond to decreased rainfall and lower levels of river discharge either by claiming greater control over portions of transboundary river basins which they see as being part of their national territories, or by developing major water infrastructure projects (dam, irrigation schemes, inter-basin transfers) in order to minimise climate impacts on their access to water, often without proper consultation with other riparian sates. The resulting cases of tensions, disputes and conflicts are the focus of this paper. The paper argues that in the West Africa context where countries are highly water-interdependent —the 17 countries that compose the Region share 25 transboundary river/lake basins— climate variability and change increases the risks of inter-state tensions, disputes and conflicts over shared watercourses. It first succinctly explains the theoretical debates to which it seeks to contribute.

The paper further describes the West Africa context in relation to the changing climate conditions it has been experiencing in the last decades. The third section analyses selected cases of disputes, tensions and conflicts around West Africa shared rivers. Cases analysed in the paper include: the middle valley of the Senegal River (between Senegal and Mauritania), the downstream half of the Niger River (between Nigeria and Niger), the Volta River (between Ghana and Burkina Faso), the southern part of the Lake Chad (between Cameroon and Nigeria). The paper then analyses the common features of these cases. Finally, it suggests mechanisms for preventing and managing the risks of climate-induced water conflicts. These suggestions are meant to make transboundary watercourses spaces for cooperation instead of fields of conflicts and tensions

2. Introduction

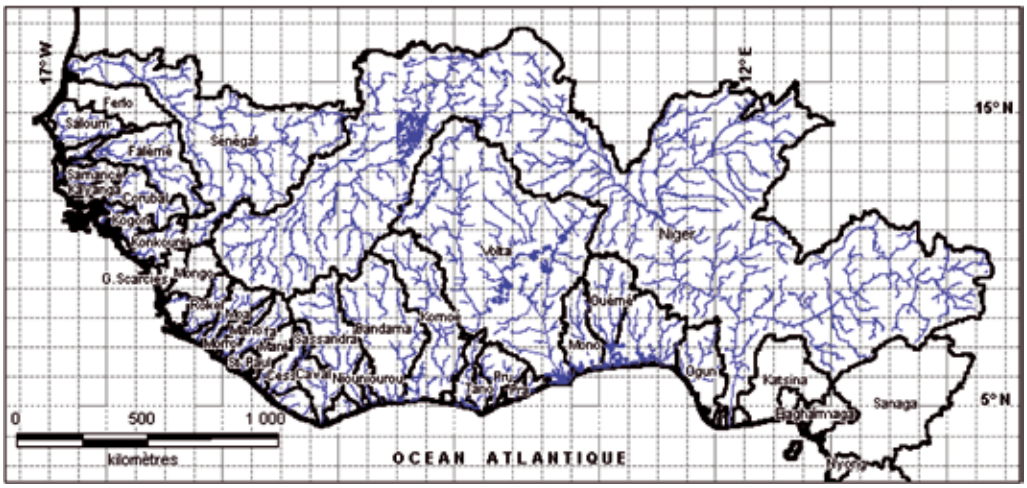


Figure 3.1: Inter-zonal water transfers by major rivers in West Africa

A number of studies carried out in recent years argue that tensions and disputes over water resources rarely lead to open armed conflicts, to "water wars" (Wolf, 2001; Postel & Wolf, 2001; Turton, 2000; Wolf et al, 2003). Records compiled by the Oregon State University on conflicts over transboundary watercourses show that so far relationships between riparian countries can be tense and disputes can occur, but the general rule is that these countries almost always end up finding agreements over modalities for cooperation rather than resorting to violent confrontations Wolf, 2001; Wolf et al 2003).

That said, it must be admitted that with the currently increasing pressure on water resources – as a result of the growing water demand – combined with decreased water availability – as a result of factors such as climate change and variability – risks of water disputes are greater, and could lead to costly regional conflicts (Postel & Wolf, 2001). These factors – growing water demand, reduced water availability as a result of climate change – currently exist in Africa where authors (like Ashton 2002) think that water conflicts are inevitable and could be a cause for regional political instability, unless appropriate measures are taken to prevent these conflicts risks and manage them when they occur.

Indeed, many factors make West Africa a region prone to water conflicts. First, West Africa countries are highly water interdependent. With the exception of the Cape Verde islands, each West Africa country shares at least one of the region's 25 transboundary river basins. Second, climate change and variability have resulted in severe decline in average annual rainfall and discharge in major river systems. Third, many countries have plans for increasing investments in large water infrastructures, such as dams with the anticipated result of not only increasing water withdrawals but also radically changing natural water allocation patterns between riparian countries.

The climate factor is generally overlooked when analysing the underlying causes of water conflicts. This is because, current efforts at assessing and addressing climate impacts – including on water – are centred at the country level. This is the case for current NAPAs (National Adaptation Plans of Actions prepared by Less Developed Countries in order to enhance their coping strategies and capacity to adapt to climate change) that are developed at the national level, with no complementary regional dimension. In these cases, climate-induced tensions and risks of conflicts between countries are not given due attention in current adaptation efforts.

The West Africa regional dialogue on water and climate and the various studies commissioned as part of this process[1] have shown the need to factor-in risks of conflicts if viable and effective responses to climate change impacts on water are to be found, at least in highly water-interdependent regions like West Africa. Failing to recognise the way and extent to which climate change and variability affect water availability and water quality may not only lead to divergences in the causes of water deficits when they occur, but could also create greater vulnerability as it prevents from anticipating and managing risks of water conflicts.

This paper seeks to help improve the understanding of the sequence of events and patterns leading to heightened conflicts risks around water resources, while paying special attention to the climate factor. It describes cases showing how climate change and variability have ignited tensions and conflicts. Some of these are cases where direct causality between climate change and the conflict risks can be found while in other cases conflict risks are indirect and sometimes long term consequences of the worsening of the climate conditions. On the basis of the West Africa experience, we suggest a set of measures for reducing vulnerability to climate-induced water conflicts.

[1] This West Africa regional dialogue (facilitated by IUCN, GWP, and CILSS) was carried out between 2002 et 2003 as part of the global Dialogue on Water and Climate.

3. Diverging views on the likelihood of intensified conflicts over transboundary waters

There is no agreement on the issue as to whether the current water crisis (water scarcity in particular) increases the likelihood of intensified inter-state competition and conflicts. Two broad opposing views shape this debate. A pessimistic, Neo-malthusian view considers natural resources scarcity as the cause of most of the recorded inter-state conflicts — assuming that one considers territories are natural resources (Kathryn et al, 2006). Since the ecological crisis of the 1970s, a growing literature links natural resources scarcity (combined with population growth) as one of the key causes of increased risks and events of both inter-state and community level conflicts (Lipschutz, 1989; Homer-Dixon, 1991). In the same vein, Critchley & Terriff (1993) argue that the likelihood of conflict is high when a resource: (i) Is essential for human survival (as is the case of freshwater); (ii) becomes increasingly scarce in a region (which is the case for water in West Africa as a result of climate change and variability); (iii) can be physically seized or controlled (for the case of water that would be through dams, canals, etc...). On the other hand, the optimistic views either downplay the magnitude of the natural resources crisis (in this case the alleged water crisis) or underline the availability of effective response options to deal with it. In the optimistic view, the imperative for cooperation is stronger than the motivation for conflict (Wolf, 1999; Yoffe et al, 2003).

This paper contributes to this debate by focusing on the analysis of real-life conflict events with the view of helping improve the understanding of the ways multiple underlying factors build up to water-related disputes, tensions and conflict risks. It also analyses the responses that are sometimes deployed to defuse these risks.

4. West Africa context: Impacts of changing climate conditions on water resources

4.1 Water interdependency

One of the West Africa region's most striking features is the stark contrast between wet and arid zones. This contrast is however attenuated by the configuration of the region's hydrographical network. The region's major watercourses (Niger, Senegal, Gambia, Lake Chad hydrographical network) have their sources in high rainfall areas, before flowing through the Sahelian zone, which experiences chronic rainfall deficits. Thus, these watercourses ensure an interzonal transfer of freshwater from wet to arid areas. These transfers, however, create a high level of water interdependency among West African countries. The 17 countries of the region share 25 transboundary rivers: The Niger river basin is shared by 11 countries against 8, 6 and 4 respectively for the Lake Chad Basin, the Volta River and Senegal River. The majority of West African countries have a dependency ration of more than 40%[2]. (see fig 3.2 and 3.3)

4.2 Increased pressure on water

The level of freshwater withdrawal in West Africa only represent 1–3 % of the region's total renewable water resources estimated at more than 1000 billion cubic meters. But if current trends are maintained, the level of water withdrawal will increase six fold before 2025 (GWP, 2000). If West Africa achieves its ambitious development aspirations, the pressure on freshwater resources will be even stronger.

If the trends in climate contexts that occured over the last three decades continue to prevail, West Africa will experience decreased freshwater availability. Compared to previous decades, it is observed that since the early 1970s, the mean annual rainfall has decreased by 10% in the wet tropical zone and by more than 30% in the Sahelian zone (see fig. 3.4) while the average discharge of the region's major river systems dropped by 40–60%.

[2] The water dependency ratio represents the share of a country's total renewable freshwater that is generated outside its borders. The water dependency ratio for countries like Niger and Mauritania is about 90%.

Figure 3.2: Major transboundary basins in West Africa

Figure 3.3: Niger River Basin (Source: WRI, 1999)

This sharp decrease in water availability has been combined with greater uncertainty in the spatial and temporal distribution of rainfall and surface water resources (Oyebande et al, 2002; Niasse et al. 2004).

4.3 Increased investments in water infrastructures in responses to changing climate conditions

In response to the unpredictability of hydro-climatic conditions and as one of the manifestations of the increasing pressure on water resources, West Africa has experienced a significant increase in the construction of large dams. Although when compared with other continents or African regions , the number of large dams in West Africa is currently low (WCD, 2000), there are a relatively large number of projects at various levels of planning (fig. 3.5); a fact which illustrates the frenetic move towards structural responses to climate change in West Africa as the region experiences a growing competition for water. On the Niger River alone, there are no fewer than 20 plans for building new large dams. Among the most advanced projects are: Fomi and Kamarato in Guinea; Kenie, Tossaye and Labezanga in Mali ; Mekrou for Benin and Niger; Kandadji for Niger ; Lokoja, Makurki, Onistha for Nigeria. Countries such as Guinea or Benin have each plans for 4 to 5 large dams which they expect to build in the coming years.

By storing freshwater during seasons and years of abundance and making it available when needed, dams are a means to address scarcity and unreliability of water and achieve a dependable water supply. By doing so, however, they often significantly affect the patterns and modalities of access to water and to other resources depending on it. Therefore, the multiplication of dams increases the pressure on water resources which translates into increased withdrawals and the alteration of flow regimes as a result of the fragmentation of river courses. Dams also pose an issue of equity in access to water and associated resources[3] (next page). Depending on their size and location, they affect more or less profoundly the conditions of access to and use of water resources at the entire basin level. In context of lower levels of water development (which is still the case in many basin contexts in Africa), upstream and downstream communities that are riparian to the same river sometimes do not even realise that they share the same waters. This situation radically changes when any of the communities (States

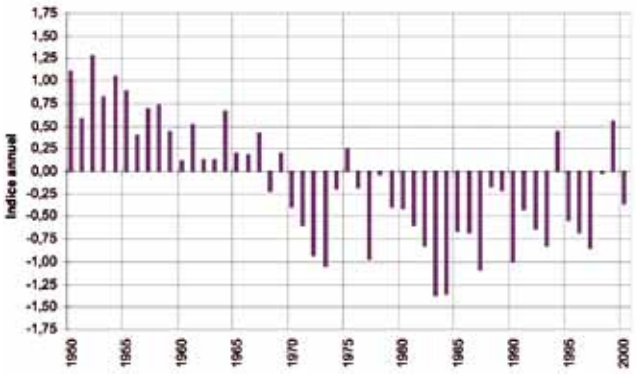


Figure 3.4: Average annual rainfall in the Sahel Regional from 1950 to 2002 (L'Hote et al. 2002)

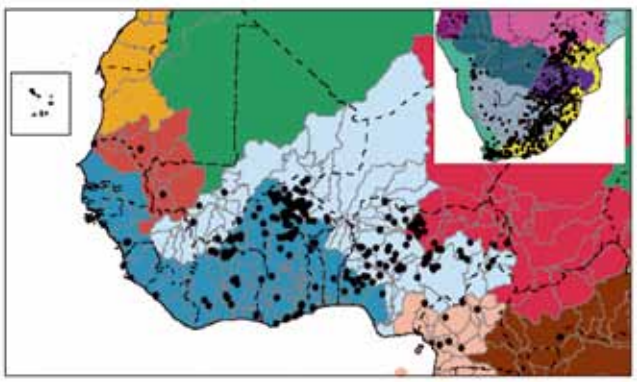


Figure 3.5: Large dams in West Africa (Source: FAO Aquastat 2007)

for example) can significantly alter the quantity or quality of the water flow —through dams, diversion canals, etc... — to the detriment of some and in favour of other users (e.g. riparian dwellers or sometimes even beneficiaries located in remote areas such as urban areas provided with electricity through hydropower development) (NIASSE, 2002) . Therefore, dams "globalise" at the basin level water management issues that would otherwise be addressed at local levels. When dams are built in transboundary basins, resulting changes in water allocation and use often create tensions and conflicts.

5. Climate-induced tensions and conflicts over shared water courses

The significant decrease in water availability – as a result of climate change and variability or as a result of increased levels of water withdrawal – combined with the multiplication of large dam projects and the high level of water interdependency create propitious conditions for tensions and increased conflict risks in West Africa. The following section describes and analyses some of the cases of overt or latent conflicts.

5.1 Mauritania-Senegal: From risks of open armed conflict to the "thickening" of the border

In the Senegal River Basin, 8 of the top ten drought years (estimated on the basis of the volume of discharge in the middle reaches of the river) during the 20th century (1904 to 1984) occurred in the 1970s and in the 1980s (Hollis, 1990). It is in this context that the Senegal River Basin Development Authority (OMVS) was created by Mali, Mauritania and Senegal with the mandate of developing and implementing a major water infrastructure programme, which included the construction of the downstream Diama Dam and the upstream Manantali Dam. In the last quarter of 1988, two years after the commissioning of the Diama and few months after the completion of Manantali Dam (both dams meant to reduce the vulnerability of riparian countries to drought and climate variability), a conflict erupted between Senegal and Mauritania. The tension began when the river started to recede from adjacent floodplains. Senegalese farmers who crossed to the right bank of the river to prepare their fields were chased by Mauritanian border guards. Senegalese authorities retaliated by deporting Mauritanian camel herds who used to spend most of the dry season in the Ferlo region of northern Senegal. A few months later, in April 1989, after a dispute between Senegalese farmers and Mauritanian herders in a territory claimed by the two countries, the Mauritanian border guards killed two Senegalese farmers and held a further 13 in custody. The tension grew, and a series of skirmishes between Senegalese and Mauritanian farmers occured along the course of the river. A few days later, shops held by Mauritanians in small riverine towns and in Dakar were ransacked and looted by bands of youth. In response, hundreds of Senegalese residents were killed in Mauritania, which lead to attacks on Mauritanians in Dakar and other big cities in Senegal, resulting in the deaths of dozens of Mauritanians. The two Governments subsequently imposed a curfew in their respective countries. By the end of June 1989, 75,000 Senegalese and 150,000 Mauritanians had been repatriated, sometimes by air (Horowitz, 1989; Parker, 1991,160; Magistro, 1993). Thousands of black people whose Mauritanian nationality was denied were deported to Senegal. The two countries severed their diplomatic relationships, and the situation remained tense for the rest of the year. The two armies deployed troops along the river, and even exchanges of heavy artillery occured in October and November 1989 (Horo-

[3] On equity issues surrounding dam building, see also: Niasse, M. 2002

Fig 3.6a: Major dams along the Senegal River

witz, op.cit; Parker, op.cit.; Magistro, op.cit.). In 1992, diplomatic relationships between the two countries were restored, but the wounds of the crisis remained for a longer period.

Since then, there is what Seck called a "thickening" of the border as a virtual wall which seems to have been erected along the river (Seck, 1991). This marks a new era as the Senegal River used to be a communication highway regularly crossed by thousands of transboundary farmers residing on one bank of the river while having their farms on the other. The number of these transboundary farmers was estimated at 37,000 in the middle of the 1970s, with 21% residing on the right bank of the river (Mauritanian side) and 79% living on the left bank (Senegalese side) (Seck, 1991). Today, cross-border farming has virtually ceased.

Recent events illustrate the precarious nature of the current situation along the border between Senegal and Mauritania. In June 2000, the Mauritanian government accused Abdoulaye Wade, the Senegalese President, elected three months earlier, of intending to exhume and re-launch the Fossil Valley Rehabilitation Project consisting of diverting water from the shared river to a network of fossil tributaries in northern Senegal. The Mauritanian government reacted immediately by giving Senegalese nationals 15 days to leave Mauritania. President Wade subsequently announced the shelving of the project, which calmed the tension[4].

Figure 3.6b: Senegal River Basin. Source: OMVS

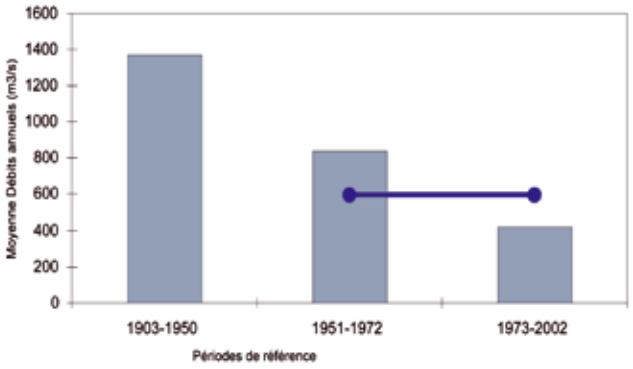


Figure 3.7: Average annual discharge in 1972-2002 is only 25% of that of 1900-1950

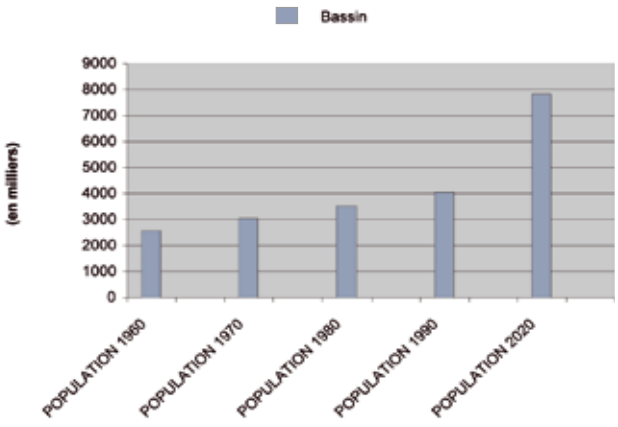


Figure 3.8: Decreased water availability, increased population pressure

[4] See: www.irc.nl/source/weekly/00223.html#senegal-mauritania

5.2 Ghana–Burkina: Suspicion and controversy over the causes of an energy crisis

The Volta River system is increasingly targeted by both Ghana and Burkina Faso to address national development needs. The Akosombo Dam, completed in 1965, created the largest man-made lake in the world with an area of 8,500 km² and a volume of 148 km³ at full reservoir capacity. In 1982, the Kpong Dam was built downstream of Akosombo. Together these two dams have an installed capacity[5] of 1,060 MW (or 95 percent of Ghana's total electricity supply[6]). In an average year, 56% of the waters flowing to the Akosombo Reservoir come from the White and Black Volta (against 44% from the Oti-Pendjari River). In 1998, the water in the Akosombo Reservoir fell below its operating level, resulting in severe power shortages and giving rise to various speculations about the causes of the low level of water inflows to the Akosombo Reservoir (also known as the Volta Lake).

One view was that Burkina Faso had unduly increased water withdrawals in the upper basin through dam building and irrigation development. Indeed, a few years earlier Burkina Faso announced plans to build three large dams on tributaries of the Volta within its territory for water supply to Ouagadougou, the capital city (Ziga Dam), and for power production. At that time, Burkina Faso had already built two large dams and an estimated 1500 small dams in the upper basin of the Volta river. In addition, the irrigated area in Burkina Faso increased from 2000 ha in 1966 to 25000 ha in the late 1990s whereas in Ghana the area irrigated increased from 1000 ha to 7000 during the same period (Andreini et al, 2000; Van de Giesen et al. 2001).

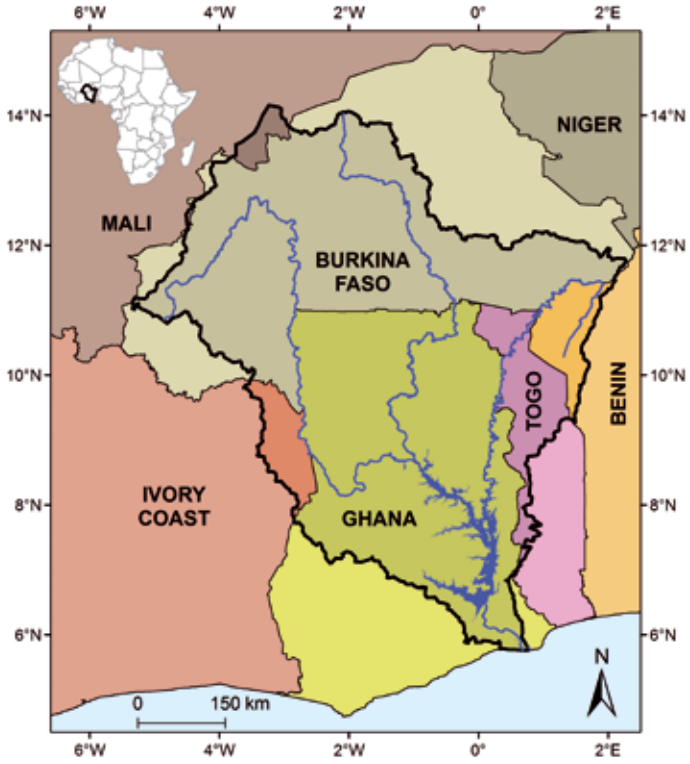


Figure 3.9: The Volta Basin
IRD/BFP Volta using base maps and data from: Dieulen, 2007 and FAO/GeoNetwork (http://www.fao.org/geonetwork/srv/en/main.home).

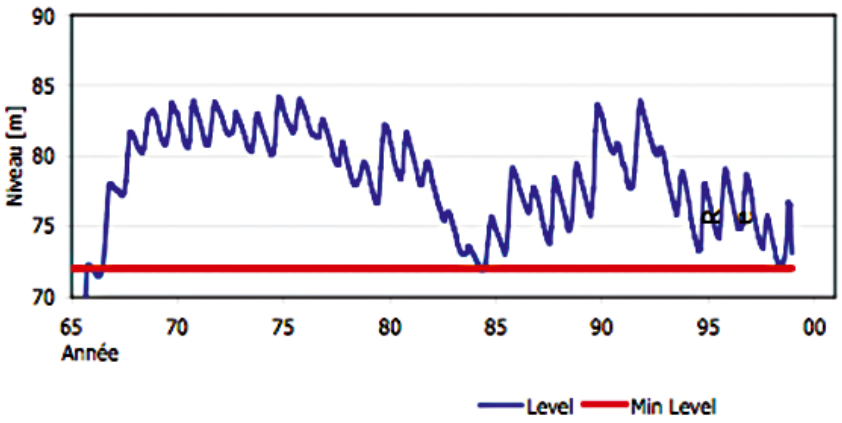


Figure 3.10: Fluctuation in the water level of the Akosombo dam reservoir (Source: Andah, 2003 based on data from GLOWA Volta Project)

[5] Sources of information for this section are: Andreini et al, 2000; Van de Giesen et al. 2001.

[6] Since 1995 Ghana has identified 17 possible dam sites with an estimated capacity of 1200 MW of power production. Of these, only the Bui dam (on the Black Volta) had reached an advanced development stage before being stalled due to, among other reasons, an intense international anti-dam campaign, the Bui dam site being located in a national park.

While these trends seem to support the feeling that Burkina Faso's investments in water infrastructures were the main causes of water deficits in the lower Volta; the total storage capacity of Burkina Faso's planned and existing large and small reservoirs represents only 1.49 km³ or less than 5% of the storage capacity of the Akosombo Reservoir (Andreini et al, 2000; Van de Giesen et al. 2001). It is therefore more plausible to link Ghana's 1998 energy crisis to reduced discharge of the Volta as a result of climate change and variability rather than to increased water withdrawals in Burkina Faso.

In addition to water withdrawals, there are two other potential sources of misconception and tensions – all to some extent related to the changing climate conditions in the basin. The first issue relates to alleged water releases from dams in Burkina Faso (particularly the Bagre Dam) resulting in floods in Northern Ghana as was the case in 1999. The second issue relates to the proliferation and migration of aquatic weeds along the Volta river system as well as visible signs of increased water pollution (Gordon et al, 1999). Today it is estimated that 30 percent of the lower Volta is covered by water weeds (mainly Pistia stratiotes, Azolla, and Salvinia) while water hyacinth which has already invaded the Back and White Volta in Burkina Faso represents an even greater threat for the lower reaches of the river basin.

mate variability over the recent years has resulted in a drop of 20–50% in the average annual discharge of the Niger River (as with most major rivers in West Africa) and taking into consideration the fact that the predicted climate change could lead to further reductions in river discharges, one can justifiable question whether climate variability and change are not going to „withdraw" more water from the Niger river than downstream countries such as Nigeria would consider acceptable (fig. 3.11). One could even fear the occurrence of instances where downstream countries blame upstream dams and irrigation schemes for what is due to climate variations.

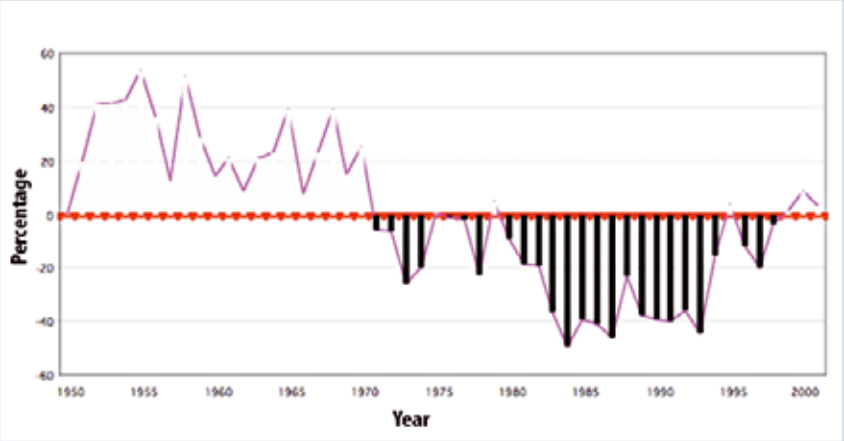


Figure 3.11: The Niger River's annual discharge in Niamey: for the period 1950-2001 (Source: Niasse et al. 2004)

5.3 Niger-Nigeria: For or against the status quo in upstream countries?

Nigeria, which has invested heavily in irrigation schemes and hydropower in the downstream part of the River Niger (Kainji and Jebba dams, 1.6 million hectares of irrigated land, river transport installations, and urban water supply), fears today that the construction of dam projects upstream such as the Kandadji Dam project in Niger and Taoussa Dam project in Mali would lead to reduced inflow to the Nigerian sector. Thus, on several occasions the Nigerian authorities expressed their concern on dam construction upstream and have expressed their opposition to any dam project on the Niger River that would involve a reduction of more than 10% in the volume of inflow received annually in Nigeria[7]. Considering that cli-

5.4 Cameroon-Nigeria on Lake Chad: Maintaining contact with receding waters

In recent years, a water dispute occurred between Cameroon and Nigeria on the southern part of the Lake Chad, in particular the village Darak and surrounding settlements. Darak – located in Cameroonian territory, 35 km East of the border with Nigeria – was been founded in 1987 by Nigerian fishermen who had immigrated in their pursuit of the progessively retreating Lake Chad – a retreat resulting from consecutive years of rainfall deficits marked by significant decreases in inflows to the lake. The maximum flooded area of Lake Chad decreased from 37,000 km2 in the early 1950s to 15,000 km2 in the early 1990s while the areas flooded for 4 consecutive months shrunk from 23,000 km2 to only 2,000 km2 during the same

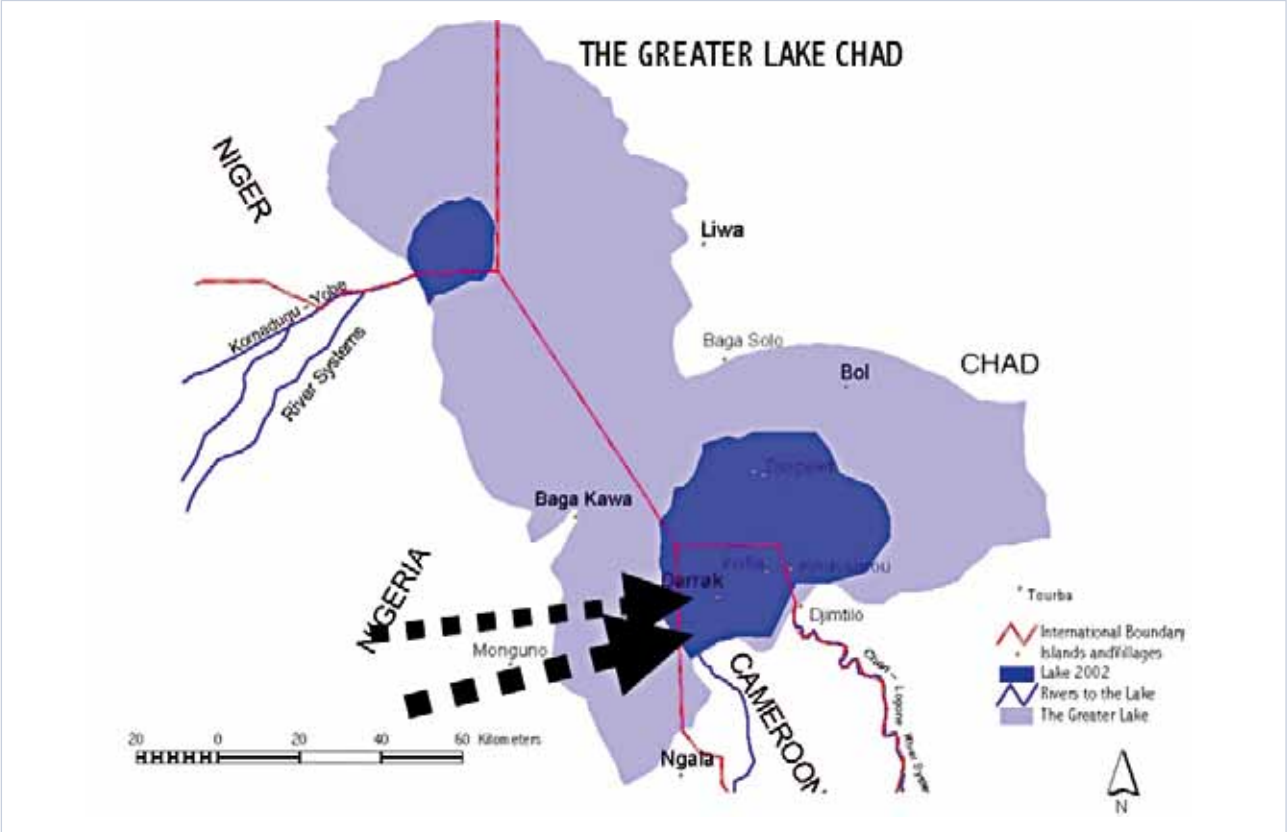
[7] NBA. 2002. See Annex 7 in particular: „Position du Nigeria sur les projets de barrages de Taoussa (Mali) and Kandadji (Niger)"

period. In the mid-1990s, more than 30 villages populated by Nigerian immigrants (with a total population of 70,000 inhabitants) were identified in the Cameroonian part of the Lake Chad Basin (IRIN News, 2003a).

The tension between Cameroon and Nigeria grew owing to the fact that Nigeria followed its citizens' movement by deploying in Nigerian dominated villages its state control and its public service functions: For example, armed forces (military and police forces), establishment of Nigerian schools and health centres, etc.. In addition, these villages were integrated in Nigeria's decentralised administration of its territory and became part of the Nigerian District of Wulgo, in the Local Government Unit (LGU) of Ngala in Borno State[8]. After a series of military skirmishes in the 1980s and 1990s, the two countries tried without success to solve the problem in the context of the Lake Chad Basin Commission (LCBC) to which they are both members. In 1994, they decided to seek arbitration at the International Court of Justice (ICJ), by adding the matter to the general border dispute[9] between the two countries that was then pending before the ICJ.[10] Following the ICJ arbitration in favour of Cameroon (October 2002), Nigeria started in December 2003, to withdraw from the disputed territory (IRIN, 2003b).

As the above illustrative cases show, risks of water conflicts are high and increasing in West Africa. It is fortunate that none of these cases have so far resulted in open armed confrontation; but one wonders how long devastating conflicts can be avoided. If nothing is done to address the issue, and if climate impacts on water get worse as it is predicted in most scenarios, the risks of perturbation of the peaceful relations between countries sharing the same watercourses could be seriously affected.

Figure 3.12: Migration of Nigerian fishermen to the Cameroonian part of Lake Chad (Base map from LCBC Remote Sensing Unit. May 2002)



[8] International Court of Justice: http://212.153.43.18/cijwww/cdocket/ccn/ccnframe.htm

[9] The most known part of this dispute relates to the Bakassi Island

[10] Le Messager No.1425 daté Oct 11, 2002 Entrevue de Douala Moutomè: Nous sommes allés à la Haye avec la certitude que c'est là que viendrait la solution. Source :www.wagne.net/messager/messager/1425/messager.html

5.5 Common patterns of conflicts risks in West Africa

The major features of the conflict risk described can be summarised as follows:

Climate change and climate variability lead to incresaing water scarcity. In trying to cope with the changing context, communities devise adaptation strategies in order to maintain access to water and to those esources they derive from it. These strategies sometimes ignore the new political context, and in particular the boundaries of modern States. That is for example the case of Nigerian villagers following Lake Chad in its retreat out of Nigerian territory.

The changing climate context can also lead States and basin organisations to develop water control infrastructures such as irrigation schemes, diversion channels or dams. In these instances, the new water infrastructures while benefiting some sections of the basins often penalise other sections. Territories perceived as benefiting from new infrastructures became then highly disputed. If they are located in border zones, each of the riparian States seek to affirm their sovereignty on these territories. "Fuzzy borders" became therefore zones of protracted dispute (case between Senegal and Mauritania). In some cases the very prospect of developing water control infrastructures triggers anticipatory reactions similar to the ones observed after these investments are made (case of Niger and Benin over the Lete Islands).

The sharing of the costs (negative impacts) of water development infrastructure is also often at the root of many interstate disputes. One of these adverse impacts is the alteration of the river regime, translating into amplified flood levels or reduction of downstream river discharge. Devastating floods that have recently occurred in the Ghananian part of the White Volta have been allegedly linked to the operations of Burkina Faso's Bagre Dam. Similarly, reduced inflows to the Akosombo reservoir is perceived by public opinion in Ghana as being caused by increased level of dam construction in Burkina Faso. Policy makers in Nigeria have in the same vain expressed fears that the Kandadji and Tossaye Dams in the Niger and Mali portions of the Niger River would result in significant decreases of water inflows to the Nigerian sections of the Niger River.

It is clear that ignorance of the real impacts of climate change and variability is a common reason of many of the tensions over shared waters in West Africa in recent years. States tend to blame their neighbours for problems that in many cases are caused by changing climate conditions.

6. Measures for preventing conflicts risks and for promoting cooperation over shared waters

In anticipation of the persistence or aggravation of current climate conditions and their impacts on West African freshwater resources, there is need to set in place effective mechanisms for preventing and managing conflicts that could arise between water users, especially between riparian States. Based on the causes of the conflicts described earlier, the following measures could help reduce the region's vulnerability to climate-induced water conflicts:

i. Increase awareness on the impacts of climate variability and change on water resources. Despite the significance of climate impacts on West African water resources, there is still a very low awareness on climate change and variability amongst not only the general public but also among policy makers and opinion leaders.

ii. Encourage international and basin-level collaboration on climatic and hydrologic data collection, management and sharing. The cases of the tensions between Ghana and Burkina Faso and between Nigeria and Niger show how critical a shared knowledge on climate change impacts on transboundary rivers is. Up to now, data collection and management efforts have been undertaken at national levels, which results in fragmented information at the levels of transboundary waters.

iii. Establish and/or strengthen collaboration mechanisms at the levels of river basins. Even if the sharing of information is done in an effective manner, conflict risks will remain, and it is therefore necessary to provide the region with strong mechanisms for managing these conflicts. Existing River Basin Organisations — the Senegal River Basin Development Authority (OMVS); Niger Basin Autho-

rity (NBA); the Lake Chad Basin Commission (LCBC), the Gambia River Development Authority (OMVG) – need to be strengthened, especially in their regulatory roles. Similarly, bilateral agreements on shared waters – for example the Niger-Nigeria Joint Committee on water; the Memorandum of Understanding between Cameroon and Nigeria on the Benoue River; the agreements between Benin and Niger or between Niger and Mali or between OMVS and Guinea – could provide effective means of collaboration for prevention risks of water conflicts[11]. Many of these agreements are however only on paper and need to be translated in actual cooperation. In cases like the Volta River Basin, there is an urgent need to establish a basin-level regulatory structure and to establish formal consultation and collaboration mechanisms at bilateral levels, for example between Ghana and Burkina Faso.

iv. Promote the adoption of emerging principles of international law on transboundary watercourses, especially the 1966 Helsinki Rules and the 1997 United Nations Draft Framework Convention on Non-Navigable Uses of Transboundary Watercourses. The set of principles spelled out in these laws can be used to formulate consensus codes of conduct at river basin levels and a water protocol at the regional level.

v. Promote the adoption of the emerging standards regarding the planning and management of dams, especially in cases where transboundary rivers are targeted[12].

vi. Promote water saving techniques and water demand management in order to decrease the currently growing pressure on the region's freshwater resources.

7. Conclusion

With the persisting degradation of the climate and the predicted worsening of the situation in the coming years, the risks of conflicts over water will increase; especially in regions such as West Africa which are composed of highly interdependent countries. A number of cases of serious risks of conflict have already been noted in many parts of West Africa. International tensions can allow for a distortion of the apparent causes of decreased water availability and/or altered water quality; upstream countries invariably being blamed for phenomena that are in reality caused by climate change and variability. In this context, the most urgent conflict prevention measures are to increase awareness on climate impacts, and to promote collaboration in hydrologic and meteorological data collection, analysis and sharing. Given that the risks of conflicts can be minimised but not avoided, it is also important to strengthen mechanisms of dialogue and collaboration on water and climate. These mechanisms include river basin organisations and bilateral agreements on water. It is also important to encourage West African countries to develop codes of conduct for managing shared waters on the basis of the emerging principles of international law. As dams are in most cases the triggers of conflicts, efforts should be made to adopt the emerging international standards regarding their planning and management, especially when transboundary rivers are targeted. At the same time, it is important to promote water saving techniques and water demand management in order to decrease the exponentially growing water demand, and so reduce the pressure on the region's freshwater resources.

[11] For a more detailed analysis of river basin organisation models in West Africa and bilateral agreements on shared waters see: Niasse, M. 2004.

[12] On these standards, see WCD. 2000; and Niasse, M. 2004b.

References cited

ANDAH, W. E.I. 2003. Climate Variability/Change and the Energy Crises in Ghana. Input to the West Africa Adaptation Strategy on Water and Climate. IUCN-BRAO. May

ANDREINI, M; N. van de GIESEN, et. al. 2000. Volta Basin Water Balance. Center for Development Research. University of Bonn. ZEF Discussion Papers. No. 21. March 2000

Ashton, P. J. 2002. Avoiding Conflicts over Africa's Water Resources. Ambio. Vol 31 No.3, May. Pp236-242

Critchley, W.H. and Terriff, T. (1993) Environment and Security. In Security Studies for the 1990's eds. R. Shultz, R. Godson, and T. Greenwood. Brassey's, Washington D.C

GWP-WATAC. 2000. Water for the 21st Century. Vision to Action for West Africa. Global Water Partnership-West Africa Technical Advisory Committee (GWP-WATAC). Ouagadougou.

GORDON, C. & J. K. AMATEKPOR (eds). 1999. The Sustainable Integrated Development of the Volta Basin in Ghana. Volta Basin Research Project. University of Ghana – Legon. Accra

Hollis, G.E. 1990. Senegal River Basin Monitoring Activity: Hydrological Issues. Part. I. IDA Working Paper No.56. Binghamton (NY).

Hollis, G.E.; Adams, W.M & Aminu-Kano, M. 1993. The Hadedia-Nguru Wetlands. Environment, Economy and Sustainable Development of a Sahelian Floodplain Wetland. IUCN, Gland.

Homer-Dixon, T. F. (1991). On the threshold: Environmental changes as causes of acute conflict, Int. Security, 16, 76– 116.

Horowitz, M.M. 1989. Victims of Development. Development Anthropology Network. 7(2):1-8

ICJ. No date. Land and Maritime Boundary Between Cameroon and Nigeria. International Court of Justice (ICJ): www.icj-cij.org/icjwww/idocket/icn/icnframe.htm

IRIN News.2003a.Cameroon-Nigeria: Border Commission discusses handover of 33 villages. Integrated Regional Information Networks(IRIN): www.irinnews.org/report.asp?ReportID=37536&SelectRegion=West_Africa). Oct. 29. Abuja

IRIN News. 2003b: Cameroon-Nigeria: Handover of Lake Chad villages begins. Integrated Regional Information Networks (IRIN): www.irinnews.org/report.asp?ReportID=38319&SelectRegion=West_Africa) Dec. 9. Lagos

Lipschutz, R. D. (1989), When Nations Clash: Raw Materials, Ideology and Foreign Policy, Ballinger, Cambridge, Mass.

Magistro, J., V. Crossing Over. Ethnicity and Transboundary Conflict in the Senegal River Valley. Cahier d'Etudes Africaines. Vol.130 XXXIII-2 pp.201-232

NBA. 2002. Réunion d'information sur les barrages de Taoussa (Mali) et de Kandadji (Niger). Niamey 6-7 août. Autorité du Bassin du Niger (Niger Basin Authority). Niamey.

NIASSE, M.. 2002. Equity Dimensions of Dams-Based Water Resources Development - Winners and Losers. In Steffen, Will; Jäger, J.; Carlson, D.J.; Bradshaw, C. Challenges of a Changing Earth. Springer. Berlin, London. Chap.6 pp.39-43

NIASSE, M.. 2004. Prévenir les conflits et promouvoir la coopération dans la gestion des fleuves transfrontaliers en Afrique de l'Ouest. In VertigO (Environmental Sciences Electronic Journal). Vol 5 (1). May http://www.vertigo.uqam.ca/vol5no1/art5vol5no1/vertigovol5no1_niasse.pdf

NIASSE, M.. 2004b. La construction de barrages sur les cours d'eau partagés: recommendations de la Commission mondiale des barrages (CMB) in Niasse, M; Iza, A. ; Garane, A. ; Varis, O. 2004. La gouvernance de l'eau en Afrique de l'Ouest (eds). UICN. Droit et politique de l'environnement, No.50. IUCN, Gland (Switzerland) & Cambridge (UK). Pp. 71-76

NIASSE; M.. 2006. Transboundary River Basins in Atlas on Regional Integration in West Africa. ECOWAS-SWAC/OECD. Paris. Aug. 2006).. Web: http://www.oecd.org/dataoecd/41/45/38409569.pdf ;

NIASSE, M. ; AFOUDA, A. ; AMANI, A.(eds). 2004. Reducing West Africa's Vulnerability to Climate Impacts on Water Resources, Wetlands and Desertification. Elements for a Regional Strategy for Preparedness and Adaptation. IUCN, Gland (Switzerland) & Cambridge (UK)

Oyebande, L.; Amani, A.; Mahé, G. and Diop, I. N.. 2002. Climate Change, Water and Wetlands in West Africa: Building linkages for their Integrated Management. Working Paper. IUCN-BRAO. Ouagadougou. April;

Parker, Ron. 1991. The Senegal-Mauritania Conflict of 1989: A Fragile Equilibrium. Journal of Modern African Studies, 29-1, pp155-171

Postel, S. L. Postel and Wolf, A.T.. 2001. Dehydrating Conflict. Foreign Policy. Sep.18 http://www.globalpolicy.org/security/natres/water/2001/1001fpol.htm

Seck, S.M, 1991. Les cultivateurs "transfrontaliers" de décrue face à la question foncière. In Bernard Crousse, Paul Mathieu, Sidy M. Seck (1991). La Vallée du Feuve Sénégal. Evaluations et perspectives d'une décennie d'aménagements. Paris. Karthala

Turton, A. R; 2000. Water wars in Southern Africa: Challenging conventional wisdom. In Water for Peace in the Middle East and Southern Africa. Green Cross International. Genève. Pp 112-130

Van de GIESEN, N.; M. ANDREINI, A. van EDIG & P. VLEG. 2001. Competition for Water Resources of the Volta Basin. Center for Devlopment Research. University of Bonn.

WCD. 2000. Dams and Development. A New Framework for Decision Making. The Report of the World Commission on Dams. Earthscan. London

Wolf, A. 2001.. Water, Conflict, and Cooperation. In Ruth S. Meinzen-Dick and Mark W. Rosegrant (eds): Overcoming Water Scarcity and Quality Constraints. 2020 Focus 9: October. Source: http://www.ifpri.org/2020/focus/focus09/focus09_14.htm

Wolf, A.T.; Yoffe, S.B.; and Giordano, M. 2003. International Waters: Identifying Basins at Risk. Water Policy No. 5 pp29-60

Yoffe, S.; Wolf, A.T.; Giordano, M. 2003. 'Conflict and Cooperation over International Freshwater Resources: Indicators of Basins at Risk', Journal of the American Water Resources Association, Vol. 39, No. 5, pp. 1109–1126.