# Chapter 25:
# Water resources management and environmental sustainability in west and central Africa

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## 1 Introduction

Shaken by decades of crisis, water resource management around the world is feeding pessimism; and, instead of appearing as a benchmark of good governance, the issue of water remains largely addressed within the context of poverty alleviation. It is through this fight that states have renewed their commitment especially in favour of the achievement of the Sustainable Development Goals[1] (SDGs) and in the pursuit of new horizons set within the framework of the water decades, [2] the latest of which (2018-2028) was proclaimed on 21 December 2016 by the United Nations General Assembly under the theme: "Water and Sustainable Development".[3]

Sub-Saharan African Countries are among the most affected: A World Bank analysis of international river basins reveals that in 1995, eight river basins were already facing water stress while four were experiencing water shortages and the number of river basins to face water stress will increase to sixteen by the year 2025. This means that a growing number of Africans will live in an environment characterised by water scarcity. [4] The same sources mention, that Africa had experienced an improvement in the water supply during the 1980-1990 water decade as coverage increased from 32% to 46%, while sanitation improved from 28% to 36%. Since the end of the decade, however, there has been stagnation, and probably more people lack adequate water and sanitation services today than in 1990. In 1994, 381 million people (then

1 On 25 September 2015, on the side-lines of the UN General Assembly, 193 world leaders took the engagement on 17 global goals known as the Sustainable Development Goals (SDGs) aimed to achieving the three key objectives during the 2015-2030 period, namely: eradicate extreme poverty fight against inequalities and injustice, resolve the problem of climate change. Clean water and sanitation is the 6th objective of the SDCs.

2 The United Nations Conference on water, held on 14 March 1977 in Mar del Plata, launched the first international decade of water (1980-1990), under the theme: "Drinking Water and Sanitation"; 2005-2015 was proclaimed as the second decade of water with the theme: "Water, a source of life".

3 Resolution (A/RES/71/222) International Decade of action on the theme: Water and Sustainable Development (2018-2028).

4 African Development Bank (2009: 3).



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approximately 54% of the African population) did not have access to safe drinking water, while 464 million (then 66%) did not have access to sanitation facilities.[5]

Today, the observation that emerges and which is partly true is that several decades after independence the challenge remains the same. Until recently, only a few African countries had implemented national policies on the management of water resources. This in turn was a result of the fact that environmental issues were still of secondary concern. Poorer countries, for the most part, predominantly focused their economic development on the exploitation of natural resources. As a result, the water sector continues to be affected - both quantitatively and qualitatively. With the combined effects of climate change, this led to the depletion of water resources. These developments also had dramatic repercussions on the grassroots' social sectors.

There are many problems across the world which have urged the international community to lay the essential legal bases for improved water protection. Thus for instance a consensus was reached for Integrated Water Resources Management (IWRM), a cherished formula that emerged from two successive international mechanisms. The first, referred to as the Dublin Principles[6], emanated from the international conference on water held in Dublin in January 1992. The second was Agenda 21[7], which was an outcome of the 1992 Earth Summit in Rio de Janeiro. Like any decision adopted on a global scale, the recommendations of these summits were to be translated into local realities. But in the absence of national legislative efforts, many states' control of water still remains doomed to failure, as the principles of sustainable and ecological management are not yet in place.

The term governance commonly refers to the way in which institutions operate to meet social needs. The latter is often determined by the positive or negative relationship between the management of natural resources and economic development. In the context of the ongoing water crisis, it has been argued that it is not so much water that is "in crisis" as it is the governance of this valuable resource.[8] While the demand for water is constantly rising, states fail to make water available to the people despite its abundance. Moreover, freshwater is being polluted and wasted shamelessly.[9]

Water is a vital human need, it touches on economic activities, it affects environmental protection, it influences regional development and is most relevant to public health. It is therefore essential that African countries improve their water governance structures in order to ensure the success in international cooperation efforts. What is needed are effective institutions, standards and procedures, which internalise and respect the principles of IWRM.

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5 Ibid.
6 Dublin Principles derived from the Dublin Declaration on water in the view of a sustainable development (ICWE 1992). See also African Development Bank (2009: 3).
7 UN Agenda 21, Chapter 18.
8 See Julien (2012: 4) with further references.
9 Ibid.



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## 2 Available water resources and the problem of bad governance

The soils and subsoils of many African countries equally abound in rich water resources. The paradox is that these are very often poorly managed. In 2009, a study carried out by the African Development Bank demonstrated that sub-Saharan Africa consisted of many least developed countries where less than half the population has adequate access to sufficient drinking water.[10] Nearly a decade later, this observation still remains valid. Several factors account for this failure, which is increased by unplanned population growth and related urbanisation as many states are unable to develop their water services.[11] A more in-depth analysis revealed, that besides legally inappropriate frameworks, factors such as poverty and conflict exacerbate the situation, especially in arid zones.

### 2.1 Poverty, climate change, conflict and pollution

The period of decolonisation of Africa was also one of gaining sovereignty over natural resources of the countries concerned. Despite the relative progress regarding the protection of natural resources, the current conditions still demand more sustainable social and economic development efforts in the interest of all segments of the population.[12]

Although Africa is credited with better prospects for growth, it remains at the centre of deep concerns when it comes to the governance of water resources, in particular, because supply capacities continue to dwindle below the scarcity threshold of 1,700 $m^3$/year according to the international standard.[13] In 2018 people without access to safe drinking water increased all over Africa, both in the rich countries (South Africa) and the poorer countries of the continent (Somalia, Sudan, Central Africa).

While it is true that water resources are a global asset, each society is responsible to make its own contribution. While we experience an increase in dry and polluted water reserves, catastrophic floods, declining quality of drinking water, states are equally responsible to counter the water crisis.[14]

Unfortunately, in Africa more than elsewhere, the water crisis is nurtured by inadequate policies and poverty, which both keep states below their capacity to develop their potential to provide training and to equip themselves with better water infrastructure. Climate variability greatly increases the cost of the required infrastructure.[15]

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10 See African Development Bank (2009).
11 Mardini (2009: 4).
12 Republic of Cameroon (2014: 4).
13 On the scarcity threshold, see Jemmali (2013).
14 IAEA (2018).
15 Blanchon (2001: 118).



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Meanwhile, deforestation continues, deserts keep advancing and drought periods are becoming longer and longer. Phenomena such as the gradual drying up of Lake Chad are a sad reflection of ecological disasters on the continent.

When the pressures on natural resources endanger various aspects of human security, it becomes necessary to delimit the risks of conflict[16] as have been recorded in recent years in Africa: In the Nile river basin between Egypt and Ethiopia (1979 and 1991); around the Okavango river, between Namibia and Botswana (1989-1993) until the establishment of a Joint Commission of the Okavango Basin; around the Senegal river, with violent uprisings in Mauritania (1989) triggering the exodus of black populations towards Senegal; at the Mauritania-Mali border (1999), where there are recurrent conflicts among villagers; around the Tana river in Kenya (2001) regarding access to water and pasture; around the wells in the El Bur region, north of Mogadishu (Somalia) between 2004 and 2006 (more than 250 deaths among others).[17]

The reasons for these water-related conflicts are numerous. Some are, however, undeniably associated with the unequal distribution of the resource:[18]

> Hydrologically, the subcontinent is clearly divided between the West, with limited resources, and the East, which has much more water. This contrast is strengthened by a very strong segmentation of river basins, inherited from the colonial boundaries. Through the interplay of agreements between colonial powers and decolonisation processes, some States, such as Malawi or Namibia, have found themselves poor in this resource.

Moreover, the unsafe quality of water is also a given fact:[19]

> Africa is regularly hit strongly by remarkable droughts (...). Water reserves dry up and the fear of an economic standstill is real. Variability is also shown by catastrophic floods. In some regions such as southern Africa, the climate follows natural cycles of ten to fifteen years, the effects of which are still poorly measured, but which are clearly incompatible with the requirements of economic development.

Another reason for conflict is the geographical distance between the water resources and developed zones, which is often "due to the continent's development pattern, based on underground resources".[20] Yet, nothing prevents states from developing a more effective normative and institutional infrastructure, where water management benefits the population and favours sustainable development.

16 Ibid.
17 Lasserre & Boutet (2002).
18 Hellendorf (2013: 117).
19 Ibid: 118.
20 Ibid: 119.



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## 2.2 The coexistence of significant differences between the available resource and satisfying the right to water

Water as a priority need is included in the category of social rights. Water security is often seen as a right which should be based on the principle of universal access. Unfortunately, in contrast to the objective of universality, many realities still stand in the way of the realisation of water as a human right. In many poor countries the lack of water often attains the humanitarian emergency threshold of 70% of the population without having access to water.[21] OECD reports that, mostly in developing countries, in addition to the 2.2 million people who die every year from diseases linked to poor sanitary conditions and unsafe water, knowledge of water resources, uses, discharges, as well as the functioning of the environment remain very insufficient to achieve global and sustainable water management.[22] This is a reality in Cameroon, Cote d'Ivoire, Niger, Togo or Mali, among others. These countries experience urbanisation coupled with population growth. Related problems concern both rainwater and wastewater[23] among others. The lack of technical capacities can be measured by the urban water supply rates, which remain low: below 41% on average, barely above 55% in large cities (of more than 1 million inhabitants) and only 27% for the urban poor.[24]

At the end of the Millennium Development Goals (2000-2015) implementation period, it was largely agreed that the global water situation had progressed while Africa was still lagging behind. This shortcoming was newly addressed in the SDG-framework in order to guarantee access to safe water and sanitation, by improving water resources management in a sustainable manner.[25] Weather this goal can be reached by the 2030 deadline is doubtful.

The CICOS basin (International Commission of the Congo-Oubangui-Sangha Basin) is the second largest hydrological basin in the world with its backbone, the Congo River, whose flow rate is 42,000 $m^3/s$, in high season and 38,000 $m^3/s$ in the dry season. The basin comprises six countries (Angola, the Democratic Republic of Congo, Congo-Brazzaville, Cameroon, Gabon and the Central African Republic). While most of these countries are facing water crises, the DRC which holds the greatest water resources of the continent –[26]

> is facing an acute crisis in the supply of drinking water. Indeed, only 26 per cent of Congolese have access to safe drinking water, an estimate that falls way below the 60 per cent average for all of sub-Saharan Africa.

21 Central African Republic Humanitarian Fund (2017: 7).
22 OECD (undated).
23 Tchotsoua et al. (1992).
24 Jaglin (2005: 5-22).
25 Sustainable Development Goals, Goal Number 6.
26 UNEP (2011: 27).



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To address water shortages, the city of Yaoundé, Cameroon for example, started a project to supply drinking water from the Sanaga River (PAEPYS). The objective was to supply an additional 300,000 to 400,000 $m^3$/d by 2020. Ambitious projects such as this have been undertaken in various countries. Senegal, for example, has completed the implementation of the Long-Term Water Programme (2002-2009) and the Millennium Drinking Water and Sanitation Programme (2005-2015).[27] The cumulative effects of many projects should be sufficient in the long-term to reduce water shortages, but a problem solved often gives rise to another. Given the very high cost of water supply projects, the repercussions are felt on the water price by the consumer. In addition, public institutions, leasing companies or private concessions that revolve around the water sector generally lack the means to ensure maintenance considering the quality of the infrastructure acquired. While channels are built across the cities, it is not uncommon for water service providers to use tankers to supply water to the population. Sometimes, it could be the people themselves, who, disappointed by the regular failure of services, resort to rudimentary methods of water supply, such as accessing natural wells or springs.

The aforementioned examples reflect the complexity of environmental and natural resources, management problems, which often relate to multisector involvement, high uncertainty and a lack of know-how to address the problems. It is in those countries with high water potential that water resources suffer more losses through deficient management marred by a lack of civic behaviour, informality, a lack of scientific knowledge and the absence of public investment. As concerns the failure to anticipate the effects of climate change, which is a real structural problem, many countries have opted for an investment-raising approach whereas they do not have a national water policy. This is a major handicap because it is the policy that serves as the foundation for legislation, strategic planning and operational management.[28] Even where such policies exist, they are often inadequate, and water legislation is poorly developed in many cases. Legislative efforts have emerged at national levels through the adoption of water laws such as in Cameroon (14 April 1998), Chad (July 1998), Burkina Faso (8 February 2002), Senegal (4 March 1981), and the Democratic Republic of Congo (31 December 2015). At the regional community level several instruments have been designed: the Water Charter for the Lake Chad Basin (April 2012), the Water Charter of Niger Basin (30 April 2008), and the Water Charter of the Organisation for the Development of the Senegal River (28 May 2002).

Many of the aforementioned instruments were developed out of improvisation and need to be connected to local realities on the ground. Like customs and traditions, governance is an empty concept without the transmission of ethical values that respect the environment. Therefore, in order to take cross-cutting issues into account, the

27 Law No. 2009-24 of 8 July 2009 on the Sanitation Code, Explanatory note.
28 African Development Bank (2009: vi).



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education component should not be left out of the package of measures, which would enable states not only to optimise water management but also contribute to the overall health situation of their populations.

## 3 Guaranteed sustainability through the dissemination of IWRM Principles

Despite the immense challenges that still exist for many African countries, they are not so oblivious as to ignore the real threats to their sovereignty over natural resources. Sustainable development is the core of the options taken on the continent and a solution for continuity named IWRM was adopted between a crisis period and the beginning of a new process of economic and social emergence. Burkina-Faso and Senegal are examples that show that water management prospects, as far as quality is concerned, are much better than before. Other countries like Cameroon, if their current efforts are sustained, could attain a sufficient level of production, to significantly reduce the water deficit, at least in the major cities, upon completing structuring projects which target the water sector. For the most part, the results achieved do not yet offer an objective comparison with other countries, while the value placed on improved water management has been amply demonstrated, at least in terms of developing national and community management schemes featuring regulations, procedures and standards with minimum requirements and guidelines for sustainable management of water. One of their qualities and not the least is the adoption of specific taxation based on water uses.

### 3.1 Normative and institutional dissemination

IWRM is a conceptual tool for equitable and rational management to achieve the SDGs. The link between water and environment has been established in line with the principles affirmed both in the context of the 1992[29] Dublin Declaration and the UN Agenda 21.[30] Many regional instruments were inspired by these international law instruments as for instance also applies to the African Convention on the Conservation of Nature and Natural Resources, adopted on 11 July 2003 in Maputo, Mozambique.

It is from the International Conference on Water and the Environment, held in Dublin in January 1992, that the world witnessed a declaration of the four principles considered as fundamental in the field of resource management. These principles state that freshwater is a limited and vulnerable resource, essential for sustaining life, development and the environment. Water exploitation and management must be based on a

29 International Conference on Water and Environment (ICWE) Dublin, Ireland, 26-31 January 1992.

30 Agenda 21, Chapter 18.



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participatory approach, involving users, planners and decision-makers at all levels; women play a crucial role in the supply, management and preservation of water. Water has an economic value in all its competing uses and must therefore be acknowledged as an economic good.[31]

Agenda 21 emerged from the 1992 Earth Summit in Rio de Janeiro, laying down priorities for the sustainable and efficient use of freshwater resources. The measures proposed concern the integrated exploitation and management of water resources; assessment of water resources; protection of water quality and aquatic ecosystems; provision of safe drinking water, food production, rural development and sanitation; understanding and monitoring the impacts of climate change on water resources.[32]

As an expression of sectoral progress in global governance, both instruments have provided an opportunity for a collective shift towards considering solutions to local water problems. In the light of their recommendations and apart from the specific legislation that has spread as a sign of attachment to international mechanisms, African countries have engaged in joint initiatives such as the Lagos Action Plan (1980). This plan incorporates an environmental protection component adopted on the basis of a strategy to strengthen local economies, sovereignty over natural resources, food self-sufficiency, industry development and the mobilisation of the population.[33] The Plan is a continental approach based on regional cooperation. It mobilised the continent's largest financial institution, the AfDB to encourage its implementation. In so doing, the Plan served as a framework for the beginning of an organisation that enabled African states to look towards the future. To go even further and beyond the stage of mere political rhetoric that does not generally yield any results, states adopted a Convention on the conservation of nature and natural resources that displays both the ambition to do everything possible to better promote the integrated management of water resources stemming from the principles resulting from the new developments at the international level, and also to provide specific answers that fall under the continent's own options. The convention has the merit of being part of a process based on the achievements of the international meetings that precede it. Article VII, dealing with "Waters", is based on the satisfaction of three main conditions.

The first, which is conservation, recommends to states to manage their water resources in such a manner as to maintain the quality and quantity of these resources at the highest possible level. To this end, parties should take measures to maintain essential hydro-ecological processes and to protect human health against waterborne diseases; prevent any damage that could endanger human health or natural resources in

31 Dublin Principles emanating from the Dublin Declaration on Water for sustainable development (ICWE 1992). See also African Development Bank (2009: 3).
32 Agenda 21, Chapter 18.
33 Robert (2015).



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another state as a result of pollutant releases; and prevent excessive extractions of these resources for the benefit of downstream communities and states.[34]

The second condition, which is planning, relies on the policies of conservation, management, use and development of groundwater and surface water, as well as the collection and use of rainwater. This condition which aims at ensuring adequate and continuous supply of sufficient water to the population, is largely dependent on specific studies of water cycles and watershed inventories; integrated water resources management; conservation of forest areas and other watershed areas and the coordination and planning of water resource development projects; inventory and management of all water resources including the administration and control of all forms of water use; controls which help to better prevent and check water pollution by establishing effluents and water quality standards.[35]

Finally, the third condition is cooperation: where surface or groundwater resources and related ecosystems, including wetlands, are cross-border to two or more parties (states), they should consult each other and, where appropriate, establish inter-state commissions responsible for their fair use, the settlement of disputes relating to the use of these resources and their collaborative development, their cooperative management and conservation.[36] Similarly, parties should undertake, individually or within sub-regional arrangements, to cooperate in the rational management and conservation of water in irrigated agriculture, with a view to ensuring greater food security and sustainable agro-industrialisation. Achieving all these goals requires a good vision, which is also a step that has been taken since the adoption of the Africa Water Vision 2025, which embodies the continental ambition for "an Africa where water resources are used and managed in a fair and sustainable manner for poverty alleviation, socio-economic development, regional cooperation and environmental protection".[37]

Even in the absence of national policies on water at the local level, African states had adopted international mechanisms to make a number of internal adjustments, despite the economic context that was not conducive for a genuinely sustainable and ecological water management. Could this be the reason why the 2002 World Summit on Sustainable Development held on African soil, in Johannesburg, examined on the ground, the realities of sustainable development and proposed the adoption of national action plans for the integrated management of water resources; a number of African countries that had adopted a water policy instrument before this date. These included South Africa, Egypt, Malawi, Mozambique, Nigeria, Uganda, the Seychelles and Zambia.[38] Today, this number has increased whether in terms of the states that have national

34 African Convention on the Conservation of Nature and Natural Resources, Maputo 2003, Article VII(1)(a)(b)(c).
35 Ibid: Article VII(2)(a)(b)(c)(d)(e).
36 Ibid: Article VII(3).
37 UN Water/Africa (2000).
38 African Development Bank (2009: 94).



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policies or those that have simply developed comprehensive water resources instruments for home use or for livestock, fisheries or irrigation purposes.

The fact that there was no 'water sector' *per se*, and that water-related activities were spread across various sectors and managed by the institutions of these sectors led to inconsistencies in the management of water resources. Today, institutions are more and more working together. Consequently, there are signs of improvement even if the results achieved are still far from the expectation and from reaching the global targets. At least, two positive things have been achieved. The first is the considerable mobilisation of resources with the support of development partners who help governments to densify and significantly expand their sanitation networks, and the second is the capacity building of local stakeholders. In Senegal, for instance, Law No. 2009/24 of 8 July 2009 provides that every municipality must have a master plan for wastewater and rainwater treatment. Every rural community must also have a local water and sanitation plan. The master and local plans, in their sanitation component, define the short and medium-term[39] sanitation policy of the local community. In Burkina Faso, the General Code of Local Authorities has transferred powers to municipalities to establish, manage and develop local public services, including water and sanitation. As a matter of fact, since 2004, local authorities have become the country's competent authorities in matters of water and electricity, and since 2009, the state's powers and resources pertaining to drinking water supply and sanitation have been gradually transferred to these authorities.[40]

Cameroon has adopted an economic policy instrument that commits the country to an infrastructure equipment programme in order to become an emerging country by the year 2035. This vision is a bet on the future, for which objectives have been previously set and for which strategies have been adopted accordingly. An integrated water resources management plan was validated in December 2009 to guide state action in the area of water resources management. Important missions are central to the role assigned to certain administrative institutions set up such as the Ministry of Water and Energy, the Ministry of the Environment and Nature Protection, among others. Also in the context of decentralisation, a role has been transferred to municipalities in the maintenance of public water supply networks. These are based, in particular, on rural engineering for the promotion of village water supply.

Decentralisation remains a good solution for tackling the water crisis and is even one of the new options that generally relates to the reform of this sector. This has resulted in the design of the IWRM, which has as an advantage to synergise stakeholders in order to facilitate the management of problems whose scope is most often beyond the capacity of a single state. The problem that community instruments are keen to solve is to allow each state to organise water management on its territory while taking

39 Law No. 2009-24 of 8 July 2009 on the Sanitation Code of Senegal, Article 8.
40 Réseau Rhône Alpes d'Appui à la Coopération (2010: 3).



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account of its neighbours. To illustrate this expanding form of co-management, several agreements can be cited, beginning with that of 6 November 1999 in Brazzaville, whereby the International Commission of the Congo-Oubangui-Sangha Basin (CICOS) was established. This commission draws on the tradition of cooperation as regards the use of international rivers.[41] For its part, the Water Charter for the Lake Chad Basin was the first milestone in sub-regional cooperation around a shared natural resource, Lake Chad. This initial legal framework, whose main merit is being among the first conventions on river basins in Africa, soon proved, however, obsolete because it did not include the most important rules of international rivers and lakes. This situation has been an impediment to the willingness of states to legitimately engage in a new era of cooperation to strengthen their 'community of interest' through the sustainable management of this shared lake. To remedy this situation of legal insufficiency, member states of the Lake Chad Basin Commission (LCBC), at the beginning of the 1970s, took the initiative of drawing up an additional treaty instrument to the basic convention.[42] Despite efforts dating back several decades, Lake Chad had shrunk by almost half, by the time the "Lake Chad Vision by 2025" was drawn up. This vision attempts to move up an already downward curve, by shedding light on the common guidelines of the member states and by emphasising the objective of sustainable conservation of the Lake and other wetlands by 2025 in order to ensure the economic security of the member states. [43]

Other initiatives also depict such shared vision. The three state signatories (Mali, Mauritania and Senegal) to the Charter of the Organisation for the Development of the Senegal River have moved in a similar direction of promoting a policy of optimal and sustainable use of the river's resources, involving the responsibility of users and an asserted policy in the field of water saving through integrated and equitable management for the benefit of present and future generations.[44] While the Organisation for the Development of the Senegal River itself has existed since 1972, the adoption of its Water Charter in 2002 enabled it to settle the issue of the method of distribution of water between uses. This method was supposed to be based on the principles of the obligation to guarantee the balanced management of water resources, the equitable and reasonable use of the river's water, the obligation to preserve the environment and to negotiate in the event of conflicts.[45] The application of the Charter is thus submitted to the Standing Committee on Water, made up of representatives of the member states.

Lastly, among the examples that can be retained, is the Water Charter of the Niger Basin, which musters its nine signatory states[46] around the objective of promoting

41 Ngodi (2012: 48).
42 Ibid.
43 Lake Chad Vision 2025, drafted in 2000 by the Lake Chad Basin Commission (LTBC).
44 Water Charter of the Senegal River (2002), Preamble.
45 Ibid: Article 4.
46 Benin, Burkina Faso, Cameroon, Côte d'Ivoire, Guinea, Mali, Nigeria, Niger and Chad.



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cooperation based on solidarity and reciprocity for equitable and coordinated use of the water resource of the Niger River basin.[47] This instrument shows that the parties pledge to take action on the basis of participation and the equitable use of resources. To that effect, the signatories took immediate measures within the framework of the implementation of the precautionary and preventive principles making it possible to prevent and remedy, as a priority, environmental damage at source. [48] As regards accountability, the Charter lays down the obligations of the parties, the most fundamental of which are the maintenance of the quality and quantity of water resources and the adoption of a policy for the planning, conservation, management and development of water resources.[49] The Charter focuses on the essential questions of costs and pricing applied to natural and legal persons who pollute or draw water. At the level of standards and procedures alone, a more sustainable water resources management framework is being tested.

### 3.2 Taxation: a deterrent and financial resource mobilisation tool

Environmental taxation, which is defined as a doctrine whose main objective is the protection of the environment,[50] demonstrates a certain degree of effectiveness in some fields of environmental protection such as forestry, by introducing the use of appropriate economic instruments to influence consumer behaviour. It is clear, that pricing plays a key role in improving water resources management by developing tariffs and levying structures based on economic, ecological, financial and social considerations. Social protection and efficient resource allocation are maximised when water prices are equal to the economic cost of its production. By influencing prices, governments are sending signals and encouraging good water use. They also encourage producers to provide water at optimal levels.[51]

Agenda 21 states that, depending on the situation in each country and where resources permit, water taxes should be introduced taking into account the marginal and opportunity costs of water, particularly when it is used for production activities.[52] A number of sub-Saharan states have introduced water taxes into their domestic legal systems through environmental codes, water policy laws or specific tax laws. Chadian law, for example, defines the general principles of environmental protection through a system of financial and fiscal incentives aimed at encouraging investment and

47 Water Charter of the Senegal River, Article 2.
48 Ibid: Articles 6 and 7.
49 Ibid: Article 10.
50 Caudal (2014: 29).
51 African Development Bank (2009: viii).
52 Agenda 21, Chapter 18, para. 59(b).



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operations to clean up and preserve the environment.[53] In Senegal, various laws, including Law No. 2001/01 of 15 January 2001 on the Environment Code, introduce a pollution tax that is determined according to the degree of pollution or pollution load.[54] Senegal's Law on the Sanitation Code provides that taxes and fees for the discharge of water into the natural environment are collected under the conditions set by the Environment Code.[55]

The objective of regulating water uses is linked to a whole chain of specific privileges granted to the administration through authorisations and declarations as well as policing measures that provide competent services with the means to ensure the control of activities carried out on water. Burkinabe Law No. 002-2001/AN of 8 February 2001 on the Water Management Policy Act provides, *inter alia*, that hydraulic installations and, in general, installations, facilities, works and activities carried out by any natural or legal person, whether public or private, and resulting, as the case may be, in withdrawals of surface or underground water, whether or not restored, resulting in a change in the level or mode of water flow, spills, discharges or direct or indirect, chronic or episodic, even non-polluting discharges[56] or deposits are subject to authorisation or declaration. Besides, installations, facilities, works and activities likely to endanger public health and safety, reduce water resources, substantially modify water levels, flow patterns or regimes, or seriously affect the quality or diversity of aquatic ecosystems are subject to authorisation. Such authorisation shall, where necessary, lay down requirements imposed on the beneficiary with a view to eliminating, reducing or offsetting hazards or impacts on water and aquatic ecosystems.[57]

The practice of authorisations leads to the collection of application fees and levies.[58] All these resources are used to finance the construction, maintenance and operation of water treatment facilities or installations and recurrent charges.[59] The peculiarity of the authorisation lies in its precariousness, that is, it is revocable if justified by public interest or in the event of non-compliance with one of the conditions laid down by it.[60] Since water is not a non-commercial good, states thus find in liberalisation an incentive to private funding and the best way to dissuade and, at the same time, offset the losses suffered by the resource.

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53 Law No. 14/PR/98 laying down the general principles of environmental protection in Chad, 17 August 1998.
54 Law No. 2001/01 of 15 January 2001 on the Environment Code in Senegal, Article L73.
55 Law No. 2009-24 of 8 July 2009 on the Sanitation Code in Senegal, Article L73.
56 Law No. 002-2001/AN of 8/2/2001 (OG 2001 No. 23) on the orientation law on water management in Burkina Faso, Article 24.
57 Law No. 002-2001/AN of 8 February 2001 (OG 2001 No. 23) on the orientation law on water management in Burkina Faso, Article 26.
58 Law No. 81-13 of 4 March 1981 on Water Code in Senegal, Article 61.
59 Law No. 81-13 of 4 March 1981 on Water Code in Senegal, Article 62. This text states, in addition, that the financial system shall define the use of the funds provided.
60 Law No. 81-13 of 4 March on Water Code in Senegal, Article 21.



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"The fear of the gendarme is the beginning of honesty". In line with this saying, water authorities have been endowed with a repressive arsenal targeting the various cases of violation of the water policy. These concern surface waters, groundwater, waters of territorial sea and waters of the exclusive economic zone.[61] The repressive arsenal punishes all discharges, spills, direct or indirect deposits, any act in general likely to pollute continental or marine waters, all discharges from the water banks and all waste substances, industrial waste, all solid substances.[62]

Water does not only require scientific knowledge but also good legislation and practices, which contribute to an education of mentalities in relation to the environment. Policing measures and fiscal incentives all result in the imposition of forms of levy on both the uses of water and its polluting activities. The combination of these elements places the sector on a field of innovation enabling it to preserve the quality and quantity of water suitable for human consumption, while regulating competing uses likely to generate the financial resources that enable the sector to withstand economic constraints.

## 4 Conclusion

The proliferation of ecological and safety threats affects water resource management in Central and West Africa and links states to a common ambition of sustainable development. Surpassing their economic difficulties to satisfy the demand for a resource directly linked to life, states have embarked on improving the governance of water resources when it comes both to supply and sanitation. The water crisis on the African continent has been a key factor in this awareness. Sustainable water management is far from being a natural phenomenon. The water crisis in sub-Saharan Africa is a social issue.

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61 The Burkinabe Law No. 002-2001/AN of 8 February 2001 on the orientation law on water management, Article L74.

62 Ibid: Article R56.



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