

# WATER SHOCKS

**Wetlands and Human  
Migration in the Sahel**

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A boy in a boat in what is left of Lake Chad. In the background fishing traps are set up.

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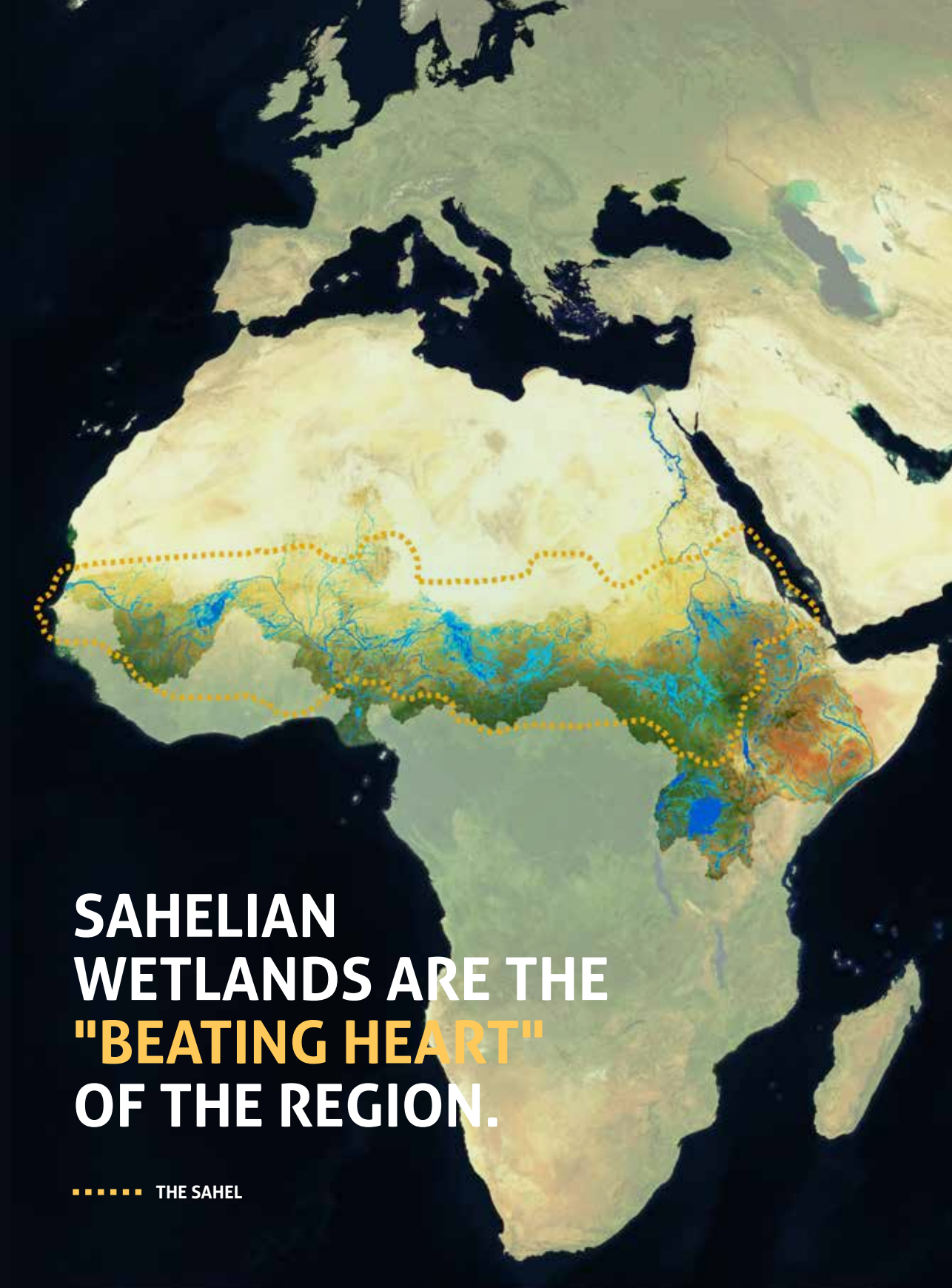
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**SAHELIAN  
WETLANDS ARE THE  
"BEATING HEART"  
OF THE REGION.**

..... THE SAHEL

# GLOSSARY

**Abstraction:** Taking water out of a water system, thereby depriving access to users downstream.

**Adaptation:** The process through which states, communities and individuals adapt to altered and altering environmental conditions. Often related to climate change.

**Agency (of migrants):** The ability of the migrant to control where, when and how migration takes place.

**Basin:** The land area that is drained by a river and its network of tributaries.

**Biodiversity:** The range of diversity of plants and animals within genes, species, habitats and ecosystems.

**Climate Change:** The change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

**Displacement:** The process through which people are forced to move from their normal place of residence due to a change in the political, social, economic or environmental situation.

**Drivers of Migration:** A range of factors, the spatial and temporal variability of which can create the conditions for migration. Migration drivers can be grouped into five inter-linked categories: social, political, economic, environmental and demographic.

**Drylands:** Arid, semi-arid, and dry sub-humid areas. Drylands are characterised by limited soil moisture, the result of low rainfall and high evaporation.

**Ecosystem services:** The aspects of natural or managed ecosystems that can be used (actively or passively) to produce wide-ranging benefits for humans. They include, for example, food (a provisioning service), attractive landscapes (a cultural service), biological pest control (a regulating service) or fertile soil (a supporting service).

**Environmental migrants:** Persons or groups of persons who, for reasons of sudden or progressive changes in the environment that adversely affect their lives or living conditions, are obliged to leave their habitual homes, or choose to do so, either temporarily or permanently, and who move either within their country or abroad.

**Floodplain:** A generally flat area of land adjacent to a river that stretches from the banks of its channel to the base of the enclosing valley walls and experiences flooding during periods of high flow.

**Internally Displaced Persons:** Persons or groups of persons who are forced or obliged to flee or to leave their homes or places of habitual residence, in particular as a result of or in order to avoid the effects of armed conflict, generalised violence, violations of human rights or natural or human-made disasters, and who have not crossed an internationally recognised state border.

**Irrigation:** The artificial application of water to land for the purpose of agricultural production.

**Livelihoods:** The ways in which people make a living. A livelihood comprises the assets (natural, physical, human, financial and social capital), the activities, and the access to these (mediated by institutions and social relations) that together determine the living gained by the individual, household or extended family.

**Meteorological drought:** A drought which is triggered by reduced rainfall, as opposed to a human induced drought, which is triggered by water abstraction.

**Migration:** The process of an individual or group changing their place of residence, either by crossing an international border (international migration) or by moving within their country of origin to another region, district or municipality (internal migration). People are normally considered to be migrants if they remain outside their original place of residence for a period of at least three months.

**Resilience:** The ability of a community or system to absorb shocks.

**Seasonal floods:** Floods that occur yearly due to increased rainfall and runoff in wet seasons.

**Sustainable development:** Development that reaches economic, social and environmental goals without impacting negatively on future societies.

**Vulnerability:** The propensity to be affected by shocks, related to socio-economic, demographic, political, cultural and environmental conditions.

**Water management:** The ways in which use and access to water is controlled. Water management can be formal or informal. Poor or non-existent water management can lead to unsustainable use of the resource.

**Wetlands:** Wetlands include a wide variety of habitats, such as marshes, peatlands, floodplains, rivers and lakes, and coastal areas such as salt marshes, mangroves, and seagrass beds. They may be natural (e.g., rivers and lakes) or human-made ecosystems (e.g., reservoirs).

# WETLAND DEGRADATION IS A CAUSE OF HUMAN MIGRATION THAT DESERVES GREATER RECOGNITION AND ATTENTION.

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## PURPOSE OF THIS REPORT

Our purpose of this report is to highlight to policymakers the relationships between the health of wetland ecosystems, management of water resources and human migration in the Sahel region of Africa. We believe these links are under-explored and poorly recognised. From a literature review, gathering of cases and interviews across the region, we have identified this as a serious knowledge gap which has potentially devastating impacts, both on the wetlands and for the humans who depend on them most directly – the region's tens of millions of rural poor.

We acknowledge that there are many different causes of human migration. Myriad inter-relations may play out according to local circumstances. We do not seek to claim that degradation of wetlands is necessarily the most important or root cause of involuntary human migration in the Sahel. But we do argue that it is a cause that deserves much greater recognition and attention.

Calls for integrated, ecosystem-based approaches to natural resource management are not new to the region. Policy concepts and significant knowledge exist that can enable integration across the landscape and different sectors, including wetlands. There are also many successful examples of community-based initiatives that enhance resilience, and support improved water management, sustainable food production and adaptation to climate change. The region needs to build on these to define policies and measures which avoid the unintentional aggravation of migration due to loss and degradation of wetland systems, and to enhance social and ecological resilience in the region.





*A group of 300 sub-Saharan Africans sit on board a boat during a rescue operation by the Italian Finance Police vessel Di Bartolo*

TENS OF MILLIONS OF  
PEOPLE DEPEND ON  
THE VITALITY OF THE  
SAHEL'S RIVERS, LAKES,  
FLOODPLAINS AND DELTAS.



*Fisher with nets, Inner Niger Delta*

# EXECUTIVE SUMMARY

This report presents the case for improving the condition of the wetlands of the Sahel as part of a strategy to address human migration and its links to the degradation of land and water resources, poverty, conflict and climate change. We offer an analysis of the key trends and issues and their relevance to existing policy goals.

## Wetlands and livelihoods in the Sahel

The rivers, lakes, floodplains and deltas of the Sahel are highly productive and biologically diverse ecosystems, fed by seasonal floods. They have played a crucial role in shaping culture and driving local and regional economies for centuries. Tens of millions of people depend on the vitality of these wetlands, whose outputs of fish, cattle and crops such as rice are directly proportional to the flood extent. Moreover, during the dry season, wetlands become a magnet for pastoralists, and act as a buffer against droughts for very large areas of the region.

But these natural assets are degrading, often due to ill-advised economic development projects intended to “harness” water resources. Water diversions for irrigated agriculture, for instance, have resulted in frequent periods of man-made water scarcity, with environmental and humanitarian impacts resembling those of meteorological droughts.

Consequently, some wetlands have ceased to be a refuge in hard times and have instead become sources of out-migration, as people look elsewhere for alternative livelihoods. While often the poorest are left behind, significant numbers of wetland inhabitants now travel to Europe with the aim of sending remittances back to their families. In places the “squeeze” on wetlands has also exacerbated conflicts over access to water and productive land, causing social breakdown and armed conflict.

## Case study findings

Following the loss of the seasonal floods due to a major dam upstream in Mali, wetlands along the **Senegal River** can no longer sustain the livelihoods of farmers, herders and fishers. Since the late 1980s, villages have emptied, and increasing numbers of people have headed for Europe. While the environmental degradation from mismanagement of the river is recognised as a problem by the authorities, the development paradigm of further irrigation expansion remains in place.

Flooding in the vast **Inner Niger Delta** has receded due to upstream water offtakes. Cooperation over fishing, grazing and crop agriculture between different ethnic groups is breaking down. Disputes among herders, fishers and farmers are increasing. More than a million people could be permanently displaced as a result of operations of existing and proposed upstream dams and water diversions.

Upstream water withdrawals for irrigation have led to massive environmental degradation of **Lake Chad** and its surrounding wetlands. This in turn has heightened competition over scarce

water resources and caused breakdown of local adaptation responses to the naturally shifting lake shores. Deepening poverty, the collapse of law and order, conflict and the forced migration of more than 2.3 million people since mid-2013 have ensued.

The once extensive **Lorian Swamp** fed by the Ewaso Nyiro River in Kenya lies outside the Sahel, but has historically provided sustenance for pastoralists from far and wide in the dry season. People fleeing conflict in Somalia took refuge here until recently, forming the world's largest refugee camp. However, the swamp is now a source of out-migration, since diversions of water upstream for intensive horticulture, combined with over-abstraction of groundwater beneath the swamp have caused it to desiccate.

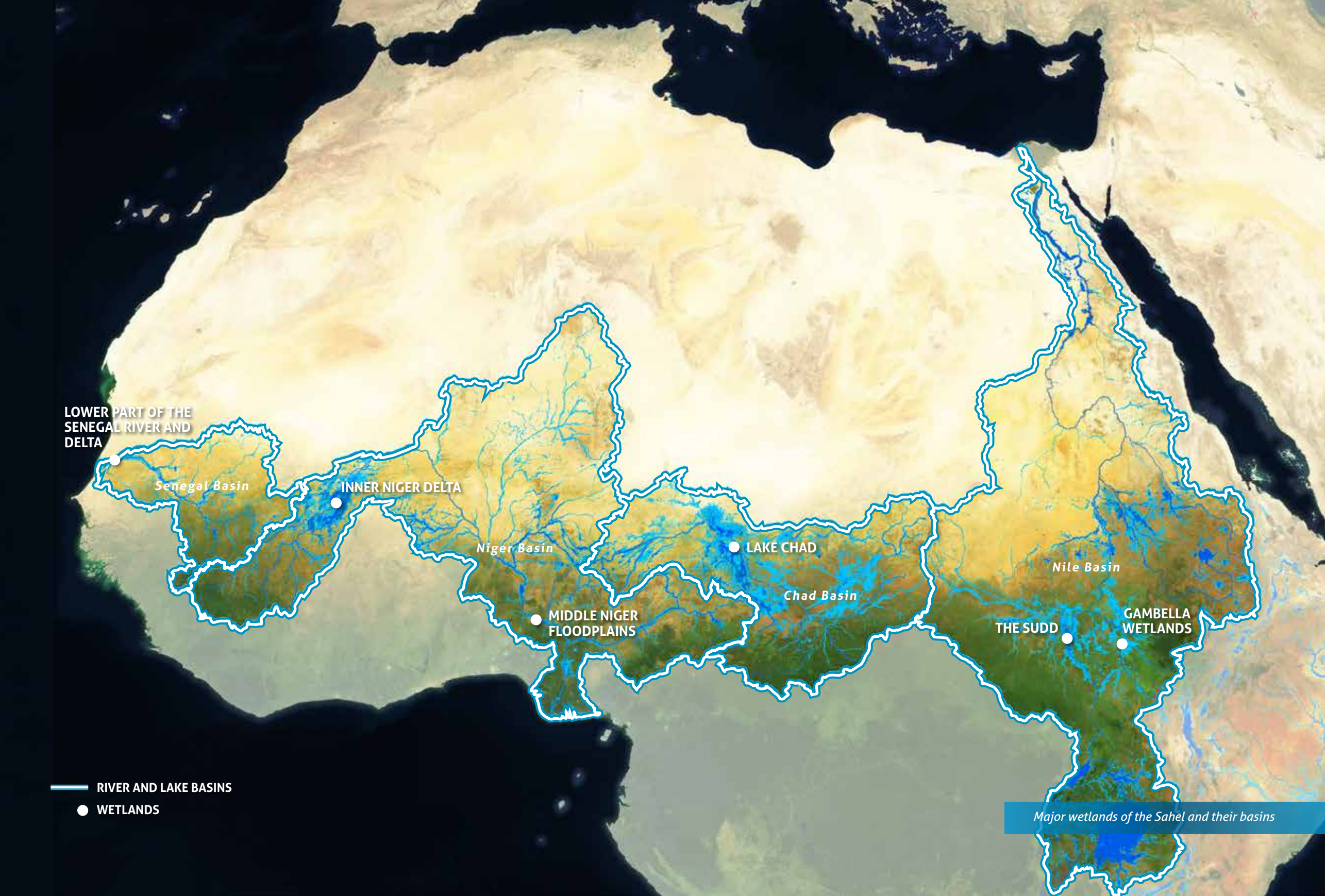
## Key conclusions

Migration is an established and valued livelihood strategy in the Sahel. But our case studies illustrate that the continuing loss and degradation of wetlands is contributing significantly to new and often disruptive migrations, including to Europe. It is hard to know how many migrants might be classified as driven by environmental decline in wetlands. What is clear is that outward migration from formerly productive wetlands – coupled with increasing conflicts over their natural resources – is now a regional trend. Moreover, we suggest that our case studies illustrate symptoms of a deeper problem with conventional forms of economic development in the region, that fail to recognise wetlands as major natural and economic assets.

Due to the interaction of water scarcity, environmental degradation, climate change, poverty and migration, risks to regional security are multiplying. To halt a spiral of decline there is an urgent need for the adoption of more sustainable forms of development – forms that reconcile food and energy production with maintaining and restoring the flood pulses of the major river systems that sustain the integrity of wetlands.

This is a tough challenge. Internationally agreed policy goals for food and water security, climate change and disaster risk reduction all point to the need for integrated approaches to land, water and ecosystem management. But implementation lags far behind, because national governments often lack sufficient capacity to integrate sectoral policies across transboundary basins.

Greater emphasis is needed on strengthening the socio-ecological knowledge base and institutional capacity of countries and basin authorities. Alongside this, investments are needed to scale up community-based approaches to safeguarding and restoring wetland ecosystems. Civil society in the region can play an important role in connecting communities and institutions, often by building on traditional knowledge. They have the potential to unite different ethnic groups, preventing and reducing conflicts and the need for out-migration.



LOWER PART OF THE  
SENEGAL RIVER AND  
DELTA

Senegal Basin

INNER NIGER DELTA

Niger Basin

MIDDLE NIGER  
FLOODPLAINS

LAKE CHAD

Chad Basin

Nile Basin

THE SUDD

GAMBELLA  
WETLANDS

RIVER AND LAKE BASINS

WETLANDS

Major wetlands of the Sahel and their basins

# INTRODUCTION

Human society in the Sahel has evolved around the inter-dependence of its drylands and wetlands – the major rivers, floodplains, lakes and deltas that occur between the Sahara Desert to the north and the savannas to the south.

**Wetlands cover more than 10% of the Sahel.**

Wetlands cover more than 10 per cent of the Sahel, while this only becomes visible when they are in full flood. Six major floodplain systems account for most of this area. They are: the **Senegal River**, the **Inner Niger Delta of Mali**, the **Middle Niger Floodplains**, **Lake Chad** and its surroundings, the **Sudd of South Sudan** and the **Gambella wetlands of Ethiopia**.

Sahelian wetlands rely on flood flows down rivers during a short rainy season lasting from June to September. They are the “beating heart” of the region, the main sources of its productivity (Thieme et al, 2005). They are hotspots of biodiversity, provide abundant fisheries, good quality water supplies, sources of fuelwood and fibre, wet ground for growing crops, and pastures that are vital during the dry season and when the rains fail (Zwarts et al, 2005; Belhabib et al, 2015).

## SAHELIAN WETLANDS PROVIDE:



BIODIVERSITY



FISHERIES



QUALITY WATER SUPPLIES



FUELWOOD & FIBRE



CROPS



PASTURES

During the wet season, inundation of the wetlands creates a mosaic of newly wetted habitats that supports the life cycles of plants, fish and other animals used by local communities. As the waters recede, grazing fields emerge that are vital for nomadic herders who move between the drylands and the wetlands. These pastoralists trade with floodplain villagers, for example exchanging milk and meat for fish. Parts of these wetlands form vital year-round food and water stores.

Yet, over the past half century, many of these wetlands have been drying up. There is correspondingly lower production of fish, rice and livestock (Zwarts et al, 2009; Brouwer et al, 2014). These local water crises are often as much a result of the human-driven changes in river flows as meteorological drought. While wetland communities have established strategies to cope with natural cycles of drought and flood, they are much more vulnerable to the effects of human interference in the region's hydrology (Mortimore, 2010). Livelihoods have become more precarious as competition increases for dwindling natural resources.

Among the coping strategies is migration. In much of the Sahel, movement is a way of life (McDowell and de Haan, 1997). Temporary migration is routine among pastoralists who travel long distances to find fodder for their animals. It is a survival strategy too for farmers and fishers. But in recent years, migration has increased, and often become permanent, as people move to cities and farther afield. Most significantly, some wetlands that were once a magnet for people in hard times are themselves becoming sources of out-migration as they shrink and lose their productivity.

Following the great meteorological droughts in the 1970s and 1980s (Conway et al, 2009), the loss of Sahelian wetlands and resulting out-migrations were usually blamed on poor rains and "desertification". But since the early 1990s, rainfall has recovered in much of the Sahel, yet wetlands have remained diminished and sometimes have lost further ground.

Lake Chad, for instance, once among Africa's largest lakes, has lost 95 per cent of its surface area since 1975 and is now divided in two. This despite a decade-long revival in rainfall across its large catchment (UNEP, 2016). As we discuss in a case study, Lake Chad has suffered from irrigation withdrawals from the lake's primary tributaries to the south. As the lake has receded, pastoralists and farmers have relocated to greener areas where they compete for land and water with host communities, while others have migrated to big cities, including Lagos, Kano and Abuja in Nigeria (UNEP, 2016). There has been a widespread breakdown of law and order.

**Local water crises are often as much a result of the human-driven changes in river flows as meteorological drought.**

**Some wetlands that were once a magnet for people in hard times are themselves becoming sources of out-migration as they shrink and lose their productivity.**

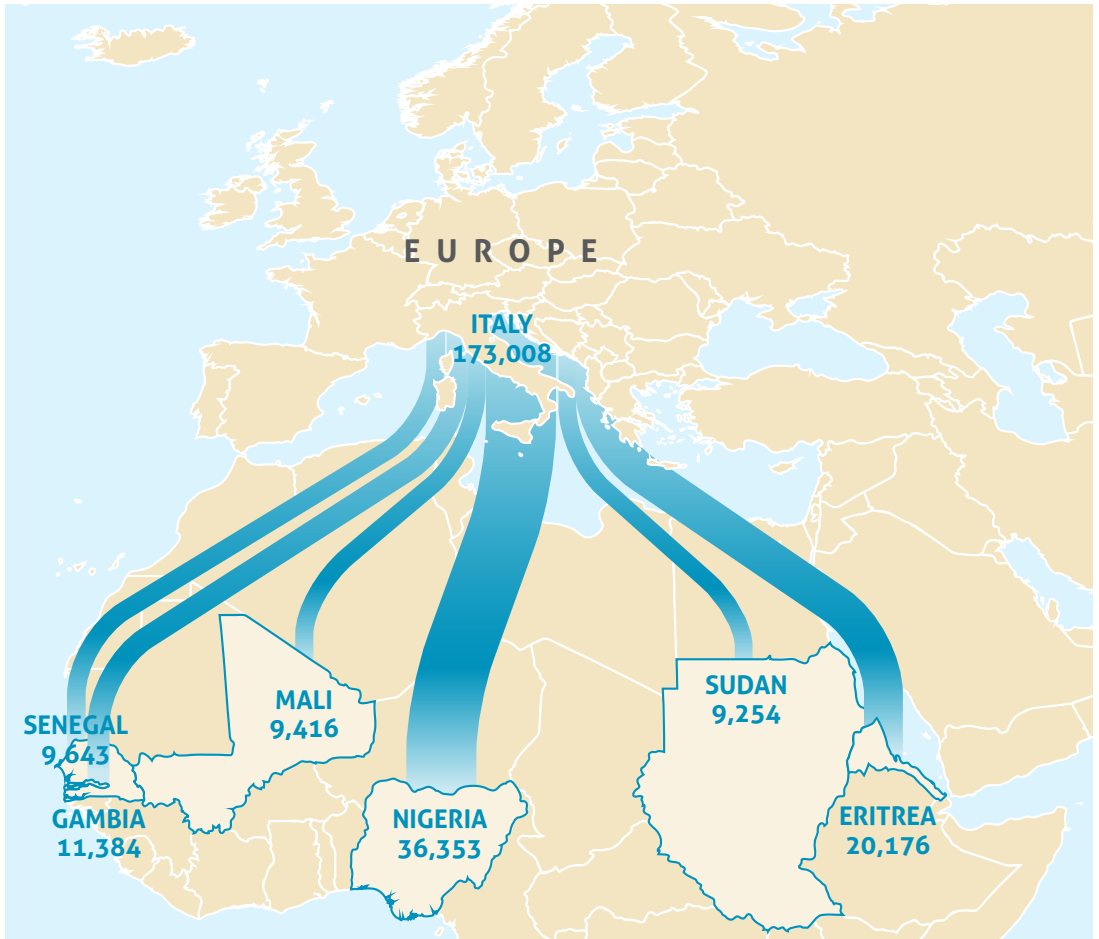


Figure 1: Most of the migrants arriving by boat to Italy (January-November 2016) came from the Sahel region (UNHCR, 2017)

Such migrations are no longer just a concern to the region. In the past two years, the exodus of people from the Sahel has become a pressing political issue in Europe (Sengupta, 2016; EU, 2016). Many of the people crossing the Central Mediterranean in overcrowded and unseaworthy boats are from the Sahel’s wetlands. The International Organization of Migration (IOM) migrant transit centre in Agadez, Niger, recorded over 300,000 migrants leaving from January to November 2016 (IOM, 2016). Most were headed for Algeria or Libya, and then Italy, which received 173,008 people by sea in the same period.



This report seeks to shed light on to two central questions:

- 1. To what extent are public water management policies resulting in the decline in the size and condition of wetlands?**
- 2. To what extent are such declines contributing to people being compelled to migrate?**

Finally, it attempts to identify some priority areas for public policy.

The links in the chain from water management through wetland health to disrupted livelihoods and human migration are clearly complex. Natural and human influences interact in the fate of wetlands. But it is clear that efforts to harness water for economic development, such as hydroelectric dams and irrigation schemes, can have unintended and damaging consequences for people dependent on natural water flows and ecosystems. There may be no easy answers, but unless the links are properly understood the dangers of unintended consequences will remain high.

In this report we do not seek to portray migration as something to be curbed. That would be to further penalise many people already disadvantaged by environmental decline. Rather, we seek to better understand the drivers of migration and displacement, and to find ways in which wetlands can be maximised as assets for all the region's inhabitants.

**Efforts to harness water for economic development can have unintended and damaging consequences for people dependent on natural water flows and ecosystems.**

**THE SAHEL'S WETLANDS ARE  
A LIFELINE AND A CRUCIAL  
INSURANCE AGAINST  
ENVIRONMENTAL EXTREMES.**



*Women selecting the day's fish catch*

# THE VALUE OF SAHELIAN WETLANDS

The Sahel is a semi-arid belt extending across Africa for some 5,500 kilometres, from the Atlantic Ocean to the Red Sea (Zwarts et al, 2009). In most years there is a short rainy season, but rainfall fluctuates greatly from year to year, and there are cycles of decades- and even centuries-long drought.

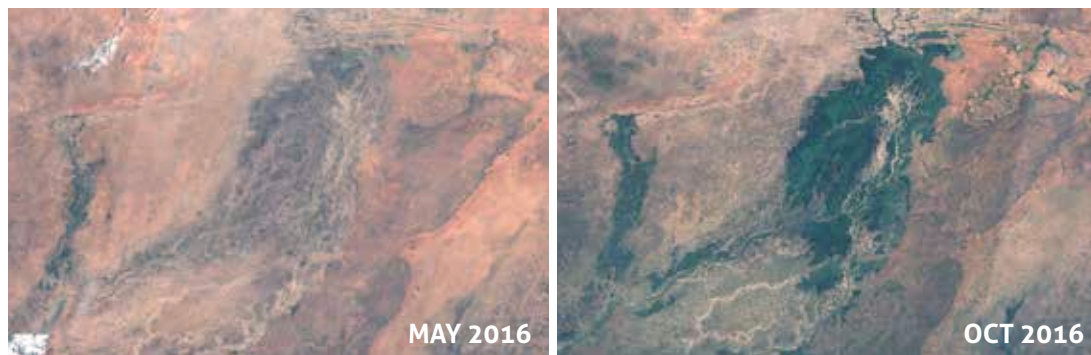
The Sahel has plenty of land; what it lacks is water, which makes its wetlands – fed mostly by rivers draining wetter regions to the south – vital resources. Viewed from space, they are anomalous green blotches on a vast yellow background. They expand dramatically when fed by rivers in spate during the wet season, but shrink with the rivers during dry times. These annual flood pulses are vital to the biological health of the wetlands, with the life cycles of many species – including fish, waterbirds, woodland trees and grasses – attuned to the seasonal cycle.

Human societies too are governed by these cycles (Dugan, 1993; Zwarts et al, 2009). Grazing herds constantly move across the arid landscape, finding refuge in wetlands during dry times. This nomadic pastoralism, though often demonised in the past, is more resilient to climate extremes than agriculture (Mertz et al, 2011). The Inner Niger Delta, for instance, provides grazing for a third of Mali's cattle.

In a region where 20 million people are categorised by the UN as food-insecure, mainly due to lack of water, the Sahel's wetlands are a lifeline and a crucial insurance against environmental extremes (UNHCR, 2015). Especially for the poorest, who depend on them the most for food, fuelwood, water, medicinal plants and much else (Assan and Kumar, 2009; Guimberteau et al, 2012).

**The Sahel has plenty of land; what it lacks is water, which makes its wetlands vital resources.**

**20 million people are categorised as food-insecure, mainly due to lack of water.**



*Floodplain extent variation of the Inner Niger Delta in a dry period (left; May 2016) and in a wet period (right; October 2016)*

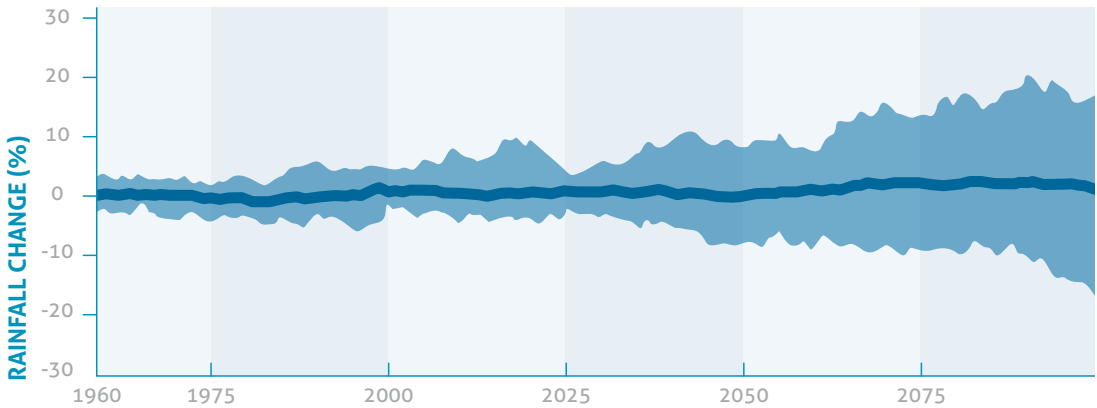


Figure 2: Projections show that current climate variability will be exacerbated. While average rainfall will remain fairly constant, episodes of both drought and extreme rains may increase (adapted from Giannini, A., M. Biasutti, I. M. Held and A. H. Sobel, 2008).

The richness of the rivers and floodplains were at the heart of the great Sahelian kingdoms of Ghana, Mali and Songhay, which developed, thrived and declined in conjunction with shifts in climate (McIntosh, 2005). And the cultural richness of Tombouctou was linked to the exceptional productivity of nearby Lac Faquibine in the Inner Niger Delta (Hamerlynck, 2016).

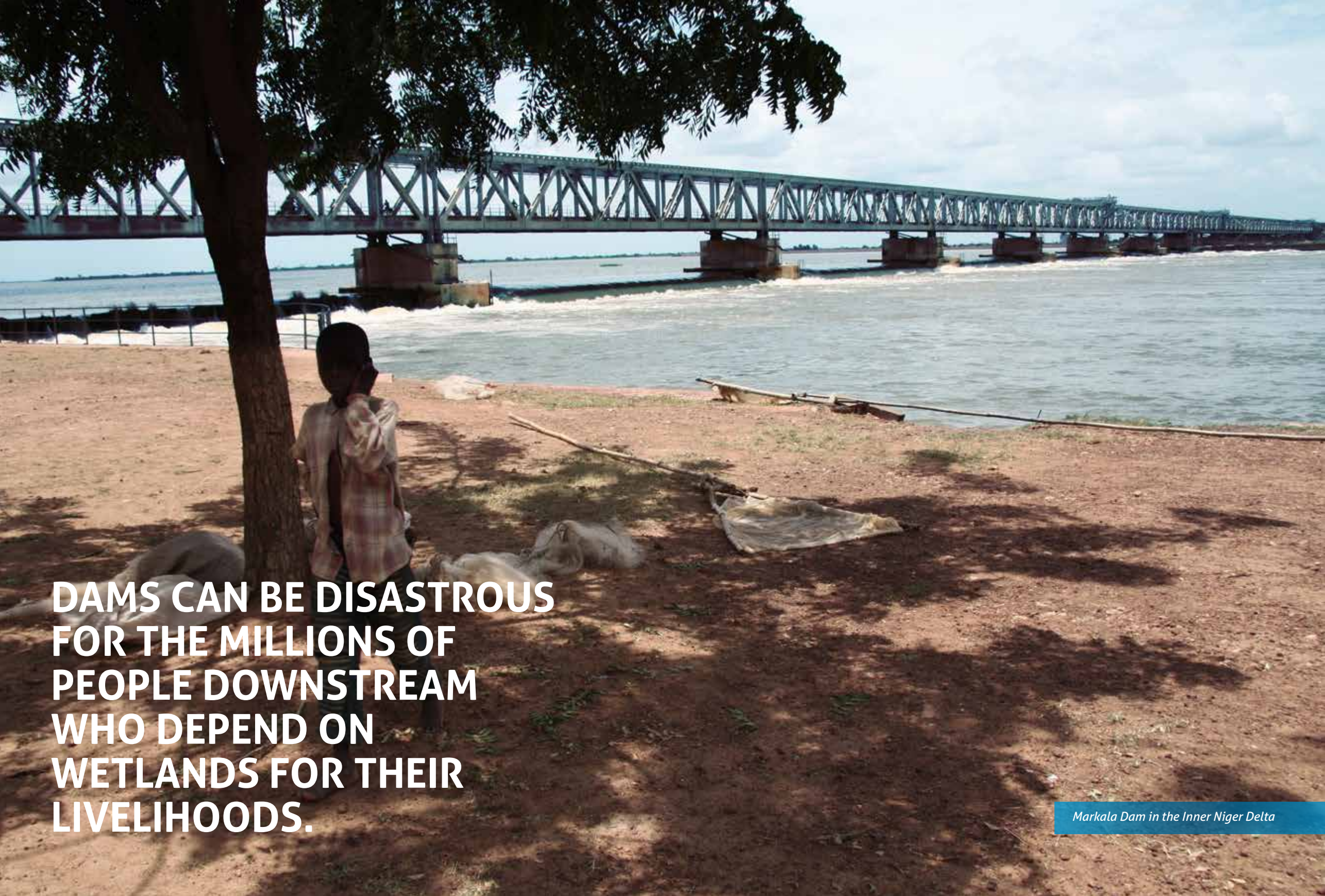
Today, while the Sahel's average population density is very low by modern standards, at just 11 people per square kilometre, most people congregate where there is water, in the river valleys and other wetlands (Zwarts et al, 2009). The Inner Niger Delta, for instance, has a population density of around 70 people per square kilometre. While it covers less than 2 per cent of Mali, it delivers 8 per cent of its GDP.

**Most people congregate where there is water, in the river valleys and other wetlands.**

The impact of future climate change on rainfall in the Sahel is uncertain, as indicated in Figure 2, but most climate scenarios indicate less rain, and there is some evidence of recent increases in the year-on-year variability of rainfall (IPCC, 2014). Moreover, temperatures are likely to increase, which will increase evaporation rates (Zwarts et al, 2009). This may further reduce river flows, while increasing the region's need for wetlands.

Yet, as our case studies show, rather than being conserved and enhanced as climate buffers, these wetlands are still being sacrificed in the name of development. The real costs of wetland loss and degradation are not being systematically assessed and factored into development decisions. The result is a squandering of the value of the Sahel's wetlands, and an emerging crisis for the region that extends well beyond its borders.

**The real costs of wetland loss and degradation are not systematically assessed and factored into development decisions.**



**DAMS CAN BE DISASTROUS  
FOR THE MILLIONS OF  
PEOPLE DOWNSTREAM  
WHO DEPEND ON  
WETLANDS FOR THEIR  
LIVELIHOODS.**

# THE DECLINE OF SAHELIAN WETLANDS

Most rivers in the Sahel flowed freely until about 1980. But in the aftermath of the great drought of the mid-1970s, many governments and aid agencies built large dams to store water and control their flows with the intention of providing both hydroelectricity and food security. The Manantali Dam on the Upper Senegal River in Mali captures a large part of the river's seasonal flood flow, which it releases gradually through turbines during the dry months. In Cameroon and northern Nigeria, dams built for irrigation on rivers such as the Logone and Chari have reduced river flows, helping cause local aridification and a catastrophic decline in the size of Lake Chad. On the Niger River, upstream dams and offtakes for irrigation have reduced dry season flows, diminishing the Inner Niger Delta in Mali.

**Upstream dams and offtakes for irrigation have reduced dry season flows.**

With dams on the region's main rivers managed primarily to meet the needs of urban electricity users and the minority of farmers with access to irrigation, the consequences for the millions of people dependent for their livelihoods on the wetland fecundity created by the annual flood pulse transforming ecosystems, has been profound (WCD, 2000). In very low rainfall years, when the wetlands all but disappear, the result is a humanitarian disaster.

**In very low rainfall years, when the wetlands disappear, the result is a humanitarian disaster.**

The Sahel's wetlands are becoming smaller, less biologically diverse and less productive (Batello et al, 2004; Thieme et al, 2005; Smith et al, 2009; Clanet and Ogilvie, 2014). Fishers in Mali report that 100 of the 145 species known to have lived in the Inner Niger Delta are no longer caught. Bird migration from Europe is also suffering. Of the 127 bird species crossing the Sahara to overwinter in the Sahelian wetlands, 75 are in decline, including waterbirds such as the Glossy Ibis, Ruff, and Black-tailed Godwit (Zwarts et al, 2009).

Despite these damaging consequences for wetlands and people, more dams are earmarked for the region. On the Niger River, about 20 sites have been identified, including the Fomi Dam in Guinea. Models predict that construction of the Fomi Dam, coupled with a planned extension of Mali's Office du Niger irrigation scheme, would deliver societal impacts resembling catastrophic drought for those living around downstream wetlands, every four years (Wetlands International, 2016).

**Despite these damaging consequences for wetlands and people, more dams are earmarked for the region.**

The conventional view has been that wetlands have to be sacrificed for economic development. However, the relatively low production of hydropower dams in the dry Sahelian region in comparison with humid

regions of Africa calls this into question. Especially since there is strong evidence that the economic costs of lost fisheries, livestock and biodiversity can greatly exceed the revenues from power generation.

There are also equity issues, with urban citizens and those with access to formal irrigation schemes winning out over poor fishers, small scale farmers and nomadic pastoralists who are directly dependent on the wetlands. The loss of productive wetland areas also results in increased pressure on those wetlands that remain. Herders may have no option but to overgraze and further denude the woodlands and grasslands. This vicious circle of land degradation tends to decrease the resilience of the poorest and most vulnerable people.

Building new dams is not an efficient way to increase economic growth and reduce poverty in the region. In fact, this approach will usually be counter-productive (Zwarts et al, 2006). Instead, alternative green growth models are called for, which improve the efficiency of the existing infrastructure, as well as enhance the current economic activities based on the sustainable development of natural resources.

**The economic costs of lost fisheries, livestock and biodiversity can greatly exceed the revenues from power generation.**

**Balances and trade-offs need to be found through improved water governance processes, between hard infrastructure developments and the need to maintain and restore natural resources.**

### **Economic Impacts of Dams on Downstream Livelihoods**

*While economic studies on the monetary value of wetlands and river-based production systems remain scant, those that have been conducted suggest that their economic value often exceeds that of conventional infrastructure aimed at economic development.*

- *Dams in northern Nigeria have much reduced the Hadejia-Nguru wetland, with economic losses to communities from the disruption of livestock grazing, crop cultivation, fisheries, fuelwood, regional aquifer recharge, and migratory waterbird habitat. The benefits of the floodplain ranged from approximately US\$9,600 to US\$14,500/m<sup>3</sup> of water, compared with US\$26 to US\$40/m<sup>3</sup> for the irrigation project. Thus the losses from the project substantially exceeded the gains (Barbier, 2003; Zwarts et al, 2009).*
- *The Manantali Dam on the Senegal River has resulted in the disappearance of up to 250,000 hectares of seasonally flooded land, a massive loss of downstream natural flood irrigation. The drying out and siltation of the river's large coastal delta has resulted in the loss of 90 per cent of its fisheries (Acreman, 1996).*
- *Cameroon's Logone River floodplain once supported more than 130,000 people through complex floodplain livelihood systems that matched the pattern and timing of river flows (IUCN, 2001). Annual flooding contributed 10.7 million euros a year to the local economy (Loth, 2004). But in 1979, the Maga dam and a water diversion scheme for rice cultivation projects diverted 70 per cent of river's flow. The sharply reduced flooding damaged downstream flood-recession agriculture, dry-season pastures, fisheries and wildlife tourism. The net annual economic costs of the changes exceeded 2.5 million euros a year (Loth, 2004).*

**URBAN CITIZENS AND THOSE WITH ACCESS TO FORMAL IRRIGATION SCHEMES ARE WINNING OUT OVER POOR FISHERS, SMALL SCALE FARMERS AND NOMADIC PASTORALISTS WHO ARE DIRECTLY DEPENDENT ON WETLANDS.**

*People walk on the dried out lake of Faguibine in the region of Tombouctou, Mali*



# DECLINING WETLANDS AS A CAUSE OF MIGRATION

European governments have become increasingly alarmed by the exodus from the region to Europe. In November 2015, African leaders were invited to the Valletta Summit on Migration in which the European Union promised 1.8 billion euros to tackle the root causes of migration from the Lake Chad region and elsewhere in Africa (Guilbert, 2015). But a central problem has remained: what exactly are those root causes?

People in the Sahel have a long tradition of migration, which is deeply rooted in their culture. Most obviously, herders move with their animals to find fresh pastures. Some people migrate in order to trade goods, and fishing communities travel with the seasons. In recent decades, a new aspect has been added, with households and communities diversifying their sources of income by sending individuals to work in cities or abroad, a strategy often seen as insurance against – or an emergency response to – environmental or other threats (Neumann and Hermans, 2015; Warner and Affi, 2014). In Burkina Faso, approximately half of all households sent at least one member to migrate for work during a drought in 2004 (Barbier et al, 2009).

People may move for a multiplicity of reasons. Push factors for mobility in the Sahel include growing populations, land acquisitions for government development projects or outside agribusiness investors, ethnic tensions, social ostracism, the decline of ecosystems and their natural resources, climate change and the interruption of river flows. Pull factors include job opportunities, a desire to pursue different lifestyles and the opportunities opened up by the establishment of migration routes, including destinations where previous migrants known to the would-be travellers now live (World Economic Forum, 2016).

The relationship between the environment and migration is inevitably complex (ICA, 2012; Gemmene et al, 2014; Copley, 2014). But anecdotally the evidence is compelling, as we show in our case studies. Villages along the Senegal River have been emptying with only those unable to travel left behind (Maclean, 2017). Many people have abandoned the drier parts of the Inner Niger Delta in Mali over the past 40 years (Zwarts et al, 2006). The shrinking of Lake Chad turned migration from a traditionally internal and seasonal activity to something international and permanent – a trend now amplified by the spread of terrorism and social breakdown (Affi, 2009; Affi, 2011).

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There is also a growing body of evidence that drought and environmental degradation, with resulting disputes over access to natural resources, in combination with fragile social, political and economic institutions have led to ethnic and other conflicts, such as around Lake Chad (World Bank and UNHCR, 2015). During dry periods in semi-arid and arid areas, people move to find access to water and productive land – that is, to wetlands. As water is scarce this can result in conflict between migrants and host communities. This in turn may trigger an exodus of people – either from fear of death or because their livelihoods are disrupted (World Bank and UNHCR, 2015).

Direct causality is difficult to establish, but a survey of 41 predominantly African countries found that droughts that cut overall economic activity by 5 per cent were related to a 50 per cent increase in conflicts (Miguel, 2016). Another recent assessment found that for people dependent on agriculture, drought conditions increase the likelihood of sustained conflict, especially among the poorest communities (von Uexkull et al, 2016).

Within the Sahel, the UN Environment Programme (UNEP) has reported that “severe reduction in natural pasture areas” along the floodplain of the Senegal River has resulted in “frequent conflicts between stockbreeders and farmers” (Tayaa, 2005).

A Nigerian government audit of environmental problems in the Lake Chad Basin in 2015 blamed “uncoordinated upstream water impounding and withdrawal, land degradation, soil erosion, deforestation and bush burning,” for ecological breakdown that “has created high competition for scarce water, resulting into conflicts and forced migration” (Nigeria Auditor General, 2015). Our case study examines this further.

A similar narrative may be playing out in the Inner Niger Delta of Mali. The long-running Tuareg rebellion in northern Mali has been attributed to drought, water capture and the political marginalisation of nomadic communities. These drivers have triggered the migration of young men to neighbouring countries, where they were radicalised (Benjaminson, 2008).

It is often not the poor in a community who are the most likely to migrate when things get bad, while they may suffer the most. This is because organising migration requires money, social networks and alternative livelihoods that only the better off possess. This emerged strongly in our interviews with villagers along the Senegal River Valley. It was clear that those who could, left, and those who could not were left behind. When environments deteriorate, the young,

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### Environmental Migration in Context

It is problematic to isolate environmental problems as the sole cause of population movements. Nonetheless, they can easily be a component of a complex nexus of drivers behind migration (Figure 3; Foresight, 2011). And several studies have shown that migrants often identify the environment as the main driver of their movements (Oakes et al, 2016). But because policymakers often categorise migrants as either displaced people, refugees or economic migrants, victims of environmental change are rarely conferred a specific status. Their specific plights and needs can easily go unrecognised (Wilkinson et al, 2016).

Environmental migration is often subdivided according to the amount of agency of the migrant (Hugo, 2010). Forced migration or displacement is said to occur when a person or household's livelihood is severely disrupted by environmental events such as floods, meaning that they have little choice. So-called voluntary migration occurs when people decide that gradual environmental deterioration means that migration can improve their situation (IOM et al, 2016). This spectrum of agency seems a questionable simplification, however. A farmer experiencing drought may have little choice but to move to the city to support his family, for example. Some argue that there is in reality no such thing as voluntary environmental migration.

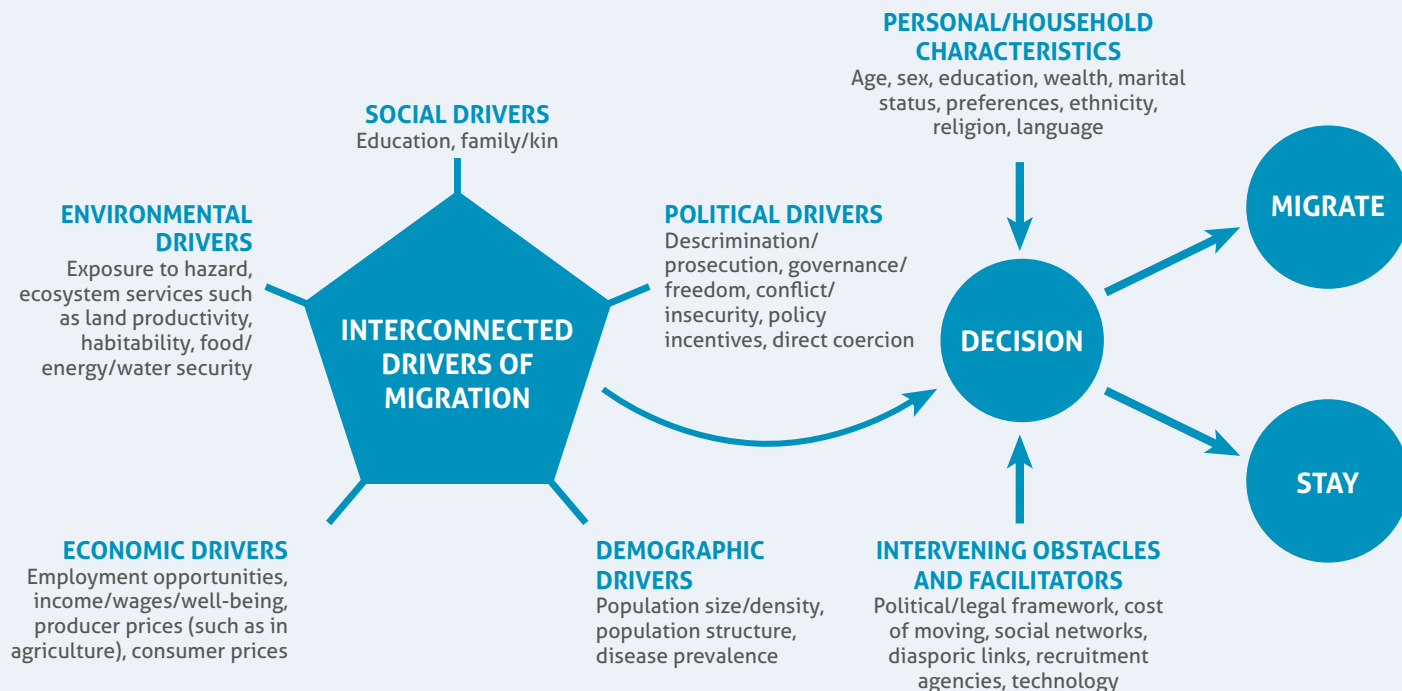


Figure 3: Drivers of migration (adapted from Foresight, 2011)

the elderly and the destitute often become trapped. And without the presence in their communities of the abler citizens, their conditions may rapidly worsen (Warner and Laczko, 2008; Black and Collyer, 2014; Warner and Afifi, 2014).

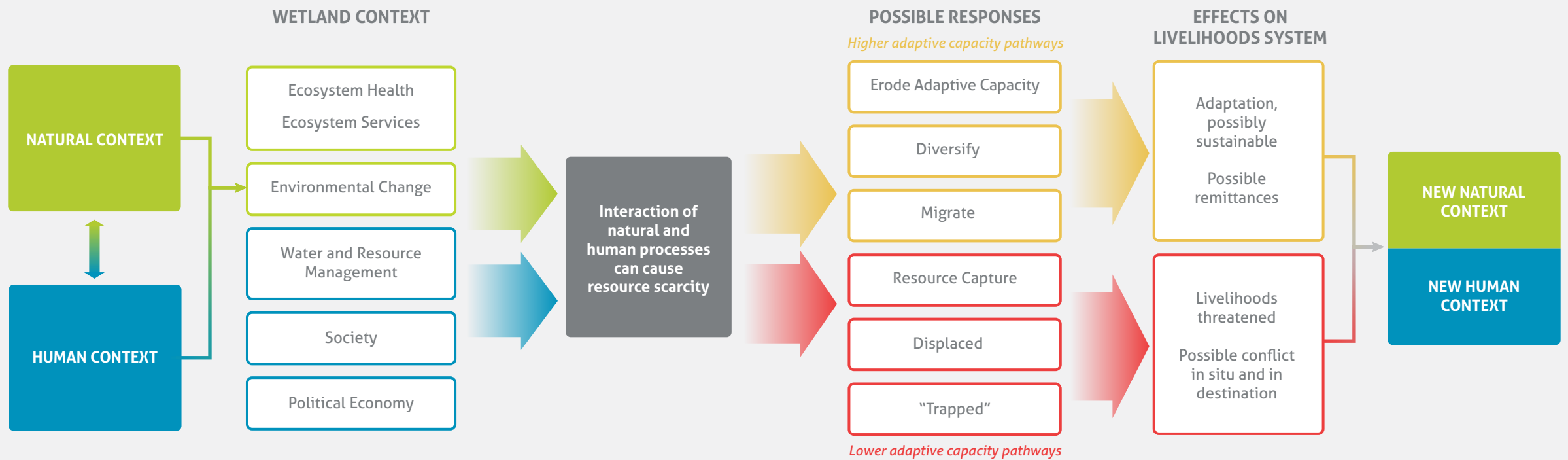
Water scarcity is often an underlying environmental driver of migration (WEF, 2016). The World Bank in its 2016 report *High and dry: climate change, water and the economy* describes what it called “the thirsty origins of migration and conflict”. Migration within and between countries “tends to increase in countries facing water shocks... Indeed, a decline in precipitation has been found to act as a ‘push factor’ inducing much of the migration to cities” (World Bank, 2016).

**Water scarcity is often an underlying environmental driver of migration.**

Water is often also central to migration in the Sahel, including through the impact of changing hydrology on wetlands. Often water shortages in the region are assumed to be due to anthropogenic climate change (Kniveton, 2012). But, as recent research and our case studies both show, many of the recent water shocks in the region are not due primarily to climate change.

Rainfall has been increasing in much of the Sahel since the early 1990s, probably following long-term cycles unconnected with global climate change. Yet river flows continued to decline, and with them the amount of water reaching wetlands. This is substantially due to the local mismanagement of water, specifically to the operation of large dams.

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There are a range of responses this can trigger among people in the Sahel, often determined by the level of adaptive capacity within the society, households or individuals affected. Some people will be able to adapt, others will be forced or encouraged to migrate. Still others will be unable to move and can be considered trapped. This movement can bring benefits to sending and receiving communities, but can also bring further risk of friction as people seek access to water in new regions (see Figure 4). Blaming climate change has disguised the real problems and diverted attention from policy changes needed to address them.

Figure 4 presents our conceptual understanding of how the condition of wetlands interacts with migration in the Sahel, informed through a combination of the case studies and existing literature. The condition of wetlands is influenced by the interaction of natural and human processes. On the natural side, ecosystems provide many vital ecological and social services, and these are affected by environmental changes such as variations in rainfall. On the human side, for example, the production of food (fodder, fish, rice) from floodplain wetlands is strongly influenced by the degree

**Blaming climate change has disguised the real problems and diverted attention from policy changes needed to address them.**

Figure 4: Schematic highlighting some of the interconnections between wetlands, water management, human migration and conflict

and timing of upstream water diversions for a range of uses (hydropower, irrigation). Such human processes take place within the context of prevailing forms of economic and social development and can contribute to vulnerability through resource scarcity.

There is a range of responses which people in the Sahel can and do take in such situations; these responses are partially decided by the adaptive capacity of the affected people. Those with higher adaptive capacity are more likely to be able to take more positive and agential measures to cope with the situation such as selling livestock or pursuing alternative sources of income as well as migration. These pathways can have positive influences on communities as they can represent adaptation to changing conditions, which can be sustainable. Migration under these conditions can be positive in both sending and receiving communities through skill acquisition and transfer and the sending of remittances. Lower adaptive capacity pathways include stealing or over-extraction of resources, forced migration and not moving, despite wanting to - the condition of being "trapped". Forced migration is always detrimental to sending communities and can also have a negative impact on receiving communities, as it is possible that there will be further degradation of and competition for resources. Through these processes and pathways, new natural and human contexts evolve.

## CASE STUDIES

The following section presents four case studies from across the region which represent current and emerging hotspots of migration associated with different major wetland systems. They are intended to capture some of the diversity of this region and the key issues, based on the available knowledge base and institutional and community perspectives. In the case of the Senegal Basin, understanding of the latter was enriched by on-the-ground interviews with various actors including migrants.



SENEGAL RIVER AND DELTA

INNER NIGER DELTA

LAKE CHAD

LORIAN SWAMP



CASE STUDY:

# SENEGAL RIVER AND DELTA





*Lower Senegal River and the Senegal Basin*

Along the Senegal River, young migrants declare they are headed for “Barca ou barzakh” – “Barcelona or death”. Their government, they say, has been promising to transform their lives for a generation. Some positive progress has been made. But currently, with little prosperity in many rural areas, and the declining natural productivity of wetlands and other ecosystems on which their families depend, they vow to make the transformation for themselves in the most drastic manner possible. Often by becoming boat people headed out of West Africa for Europe.

A journey in mid-2016 along the valley of the Senegal River, which forms the border between Senegal and Mauritania, revealed that its wetlands, once a source of natural wealth, have become a hotspot for outward migration. The wetlands can no longer sustain local livelihoods. Farmers, herders and fishers are battling against ecological breakdown that has followed a re-engineering of the river and its hydrology in the name of economic development.

Seydou Ibrahima Ly, a teacher in the riverside village of Donaye Taredji, said: “Compared to the past, there aren’t many fish. Our grandparents did a lot of fishing, but we don’t.” He was clear about

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*-Seydou Ibrahima Ly*

why. "In the past, the river had a flood that watered wetlands where fish grew. Now there is no flood because of the dam." The Manantali Dam upstream in Mali is one reason why around 100 people have left his village, he said. "In some villages, they are almost all gone."

Local migration has a long tradition in the Sahel. It is a tried-and-tested coping strategy to find pastures for livestock and water to grow crops (Loth, 2004; Zwarts et al, 2009; Traore and Owiyo, 2013; Clanet and Ogilvie, 2014). Ever since drought engulfed West Africa in the early 1970s, many poor Senegalese have been moving to cities such as the capital, Dakar. But recently, more and more have fled to foreign lands. And with visas ever harder to obtain for travel to popular destinations like France, Italy or Spain, they are paying people – traffickers – to take them by sea.

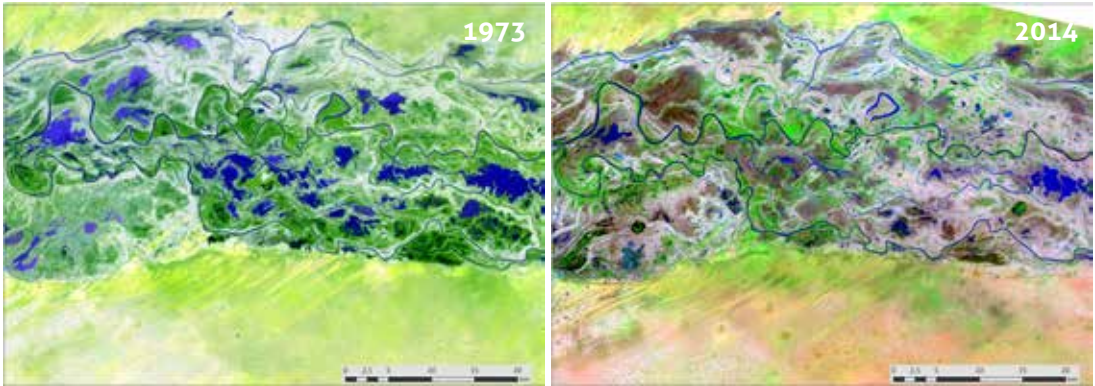
"After the Libyan crisis in 2011, we have seen an increase in the numbers of migrants leaving the country," said Nicolas Mendy of the Senegalese Red Cross, during an interview in Saint-Louis, the former capital of French West Africa at the mouth of the Senegal River. He was attending a meeting with families of migrants who had disappeared en route to Europe. "They mostly go to Mali or Niger by bus, then cross the Sahara to Libya and take boats to Europe." According to the IOM, more than 5,000 Senegalese reached Italy alone during 2015. "Many others died in the attempt", said Mendy. All told, at least half a million Senegalese are thought to be living abroad, and two-thirds of households have at least one member who has emigrated (Plaza, 2011).

The exodus is occurring despite investments by the government in developments along the Senegal River. Since the 1970s drought, the nations of the Senegal Basin have harnessed the river's flow to generate hydroelectricity and irrigate fields along its banks. On behalf of member governments, OMVS commissioned two dams: the Manantali in upstream Mali to hold back floods and create a regular year-round flow; and the Diama in the river's large delta, which prevents saltwater from the Atlantic Ocean penetrating upstream.

The dams have benefitted many. But OMVS conceded in a recent environmental analysis of the basin that eliminating the annual flood has created extensive ecological problems – and human losers as well as winners. The project "has made flood-recession crops and fishing on the floodplain more precarious, which makes the rural production systems of the middle valley less diversified, and therefore more vulnerable". This outcome is at odds with the agency's primary mandate to "ensure food security for all people within the river basin and region" (Hamid, 2014).

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*Satellite images comparing the Senegal river and its tributaries, lakes and floodplain forests in 1974 and 2014. Comparing the two scenes, many lakes (blue areas) have a smaller area in 2014 and most of the flood forests (dark green areas) have been replaced by agriculture (light green areas) and bare land (brown areas). This is representative of the effects commonly seen after the construction of upstream hydropower dams and irrigation schemes.*

The dams and related irrigation schemes on the Senegal River are estimated to have resulted in the loss of 90 per cent of the fisheries in the river's delta. They have also caused the disappearance of up to 250,000 hectares of seasonally flooded land, where farmers planted crops as the waters receded, pastoralists grazed their animals and forests and wildlife flourished (Acreman, 1996). UNEP reported a "severe reduction in natural pasture areas" with "access to the river... very difficult for cattle," resulting in "frequent conflicts between stockbreeders and farmers" along the river (Tayaa, 2005).

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Podor Department, in the middle reaches of the river, exemplifies this diagnosis. Many villages there are emptying, as those who once depended on the river's old ways have lost out since the completion of the dams. Guiya village has suffered what local pastoralist and farmer Idrissa Fall said was a "mass exodus that began in the late 1980s. I thought of going when I was young, but my mother told me not to," he said. Twenty years later, he had no regrets, but said young people who did leave home return a few years later far richer than he could ever hope to be at home.

"The migrants know the boats are dangerous, but they have a determination to go and find a better life," said Oumar Cire Ly, deputy chief of neighbouring Donaye village. While some migrants to Europe lost their lives, many who survived the journey have done well. "My elder brother went to France and he is now a teacher at the University of Le Havre," Cire said. "He still sends money back to the village, even though his family now lives in France." Oumar did not expect the outflow to halt any time soon.

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*-Oumar Cire Ly*

Some of the worst environmental problems driving outward migration are found in the river's large coastal delta. A combination of the end of the seasonal floods and large scale water abstractions upstream for irrigation has resulted in large areas of the once-functional delta drying out, with channels and lakes clogged with silt and fast-growing weeds such as *Typha australis*, which currently occupies some 150,000 hectares of the delta (Tayaa, 2005).

The OMVS environmental analysis notes: "All the evidence indicates that invasive plant proliferation has been promoted by... the two large reservoirs and the surrounding irrigated area that have together changed the river's hydraulic regime and water quality" (Hamid, 2014). The Lac de Guiers, once the largest lake in the delta, has lost half its capacity and is overgrown with *Typha*. "The situation has pushed a lot of people to move to other areas, like Dakar or beyond," said Adama Gaye, environment director of the Office of Lac de Guiers (OLAG), which was created in 2010 to revive the lake.

The Ndial Wetland was once famous for wildlife, from pelicans to manatees, and simultaneously provided grazing for tens of thousands of cattle. But all that ended when the water channel that provided it with water from the Lac de Guiers dried up (Kindzeka, 2015). Things have deteriorated further since an Italian agribusiness company moved into the area, intending to take water to grow biofuels and rice. There have been battles in which several cattle herders died (Pearce, 2016).

One unexpected effect of these massive changes to the hydro-ecology of the delta has been an increased risk of flooding because of the diminished conveyance capacity of the silted river channels. At special risk is the city of Saint-Louis (Tayaa, 2005). One wet night in 2003, as the build-up of water in a delta channel threatened to overwhelm the town, engineers made an emergency breach through a sand bank to allow the floodwaters to escape to the ocean. It did the job, but ever since, the channel has grown ever wider. It is now more than six kilometres across. Through it, the sea invades the once quiet lagoon behind the sand spit. Atlantic breakers and scouring tides are eroding mangroves and washing away entire villages in Gandiole, a district on the outer fringes of the delta south of Saint-Louis.

The productivity of agriculture and fishing in and around the lagoon has been impacted by the more brackish waters, while the death of mangrove trees leaves the coastline ever more vulnerable to further erosion. The result has been a surge in migration from a series of villages along the shores of the lagoon. "Young people lost heart when the land became saline. They didn't want to stay, so their only

**"Young people lost heart when the land became saline. They didn't want to stay, so their only option was migration."**  
*-Diappo Liquey*

option was migration,” said district president Diappo Liguey. “Almost every household has someone who left,” one would-be migrant reported in a recent study (Sall et al, 2011).

Remittances from migrants to Europe are now a major source of income and worth more to the country than foreign aid, according to the World Bank (Maimbo, 2005). They have been estimated to account for two-thirds of household cash income in the Senegal River Valley. Many of the new buildings – including grand mosques and schools in tiny villages such as Salnde Fanaye in Podor Department – have been built with money sent home by successful migrants.

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There is a growing awareness in government that nature’s wet areas – the floodplains and other kinds of wetlands – have a value that is being lost and should be recovered. But the understanding remains limited. Lamine Ndiaye, (director for environment and sustainable development at OMVS), said that OMVS sees wetlands primarily as potential lures for tourists, boosting local cash economies and providing jobs for tour guides rather than farmers, fishers and herders.

But that carries little weight when it comes to taking decisions to boost irrigation at the expense of wetlands. The government has a target to expand irrigation from the current 100,000 hectares to an eventual 400,000 hectares, much of it in the Senegal Valley, said Ndiaye. If that policy comes to fruition, then few doubt that the result will be less water in the river, and further damage to wetlands, their ecosystems and their economies all the way to the delta. Fewer fish; fewer pastures; less flood-recession agriculture, more poverty among the millions who depend on wetland resources – and in all probability a further surge in migration.

*The government of Senegal recognises the connections between wetlands decline and poverty, and has committed to reverse these trends by establishing a specific Wetlands Policy (adopted in July 2015) which it aims to use as a tool for the sustainable management of wetlands. This National Wetlands Management Policy for Senegal is aligned to the government’s strategic vision “Plan Senegal Emergent”, which is the main repository of economic and social development for the country. Some small scale initiatives in the Senegal Basin, supported by Organisation pour la Mise en Valeur de fleuve Senegal, (OMVS, the Senegal River Basin Development Organisation), show the potential to restore water flows to wetlands and so bring back local livelihoods and biodiversity (SDAGE, 2012).*



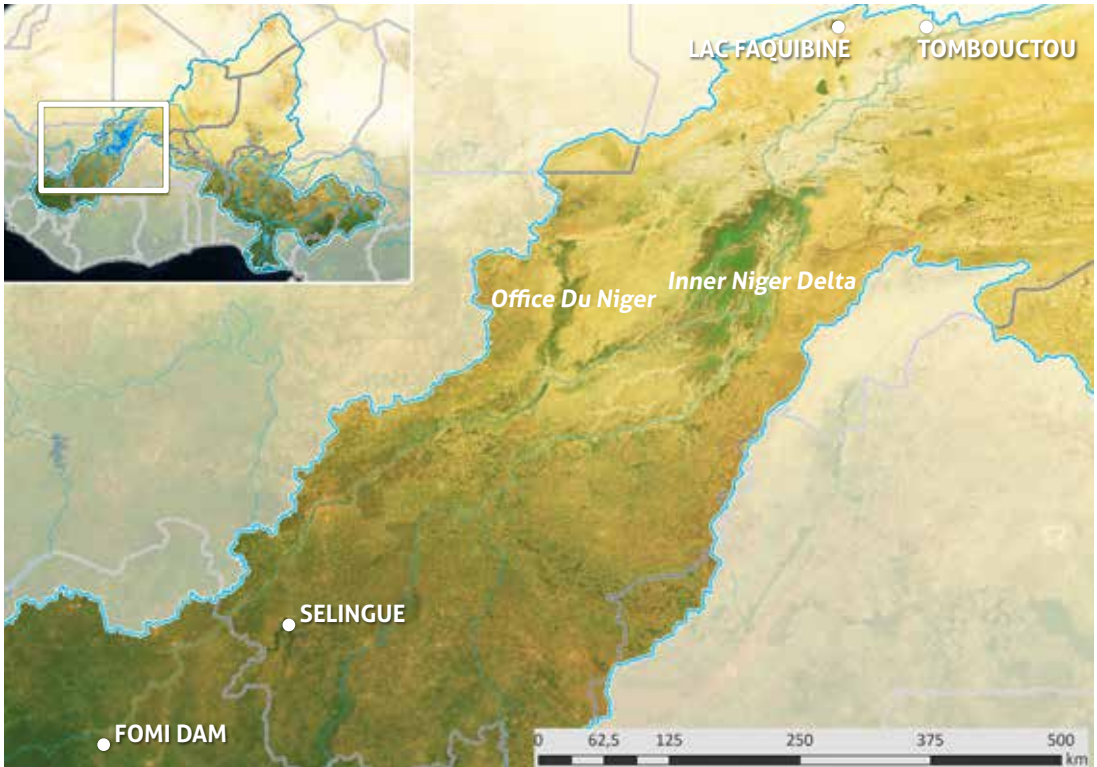
*Fisher, Senegal*



CASE STUDY:  
**INNER NIGER DELTA**



*Cattle herd crossing the river in the Mopti Region, Mali*



*Inner Niger Delta and the Niger Basin*

One of the Sahel's greatest natural assets, a magnet for fishers, pastoralists and farmers, is becoming a source of outward migration, a starting point for migrants heading for Europe (ICG, 2016).

The Inner Niger Delta is a giant wetland in northern Mali. Covering an area the size of Belgium, it is the largest river floodplain in West Africa and in the 15th century was the heart of the Empire of Mali, which stretched as far as the Atlantic Ocean. The delta is recognised today as a wetland of international importance, not least for the vast populations of waterbirds that travel there from Europe each year (Ramsar, 2010). For humans harvesting nature, it is also one of the most productive areas in one of the world's poorest countries. Here, fishers, farmers and herders from different ethnic groups have traditionally cooperated to make the maximum use of the delta's resources.

But that productivity and harmony are being threatened by the diversion upstream of water for irrigation projects. And plans for a hydroelectric dam upstream in Guinea could cause large areas of the wetlands to dry up most years, triggering a mass exodus.

**The Inner Niger Delta is one of the most productive areas in one of the world's poorest countries.**



*Cattle grazing on bourgou grass as the floods recede in the Inner Niger Delta*

The Inner Niger Delta is an unusual feature occurring where West Africa's largest river, the Niger, spreads out across flat desert land west of Tombouctou. Its lakes and wetlands expand and contract with the seasons. In summer, when the flow is strong down the river, they fill with fish and fishers. When the waters recede, leaving behind damp and nutrient-rich sediments, farmers move in to plant rice, millet and other crops. Elsewhere, cattle herders bring their animals from across the region to feed on the rich bourgou grasses exposed by the retreating water.

The ecosystem is hugely productive both for nature and humans. At its largest, the delta covers just 1.6 per cent of Mali, but it provides pasture for a third of the country's cattle, delivers 8 per cent of its GDP and sustains two million people, 14 per cent of the population. Its fish are exported across West Africa.

All this is threatened as water abstractions upstream that irrigate thirsty crops like rice, sugar cane, and cotton deprive the delta of water for the annual inundation that is the basis of its fecundity. Leo Zwartz, a Dutch hydrologist, calculated that existing abstractions have cut the area of delta flooded by up to 7 per cent each year (Zwartz et al, 2005).

The diminished waters have caused declines in forests, fisheries and bourgou grass. The stable social structures that ensured harmonious use of the delta's resources have been fractured, as Fulani herders

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dispute with farmers over the available wetlands and pastures. Tensions boiled over in 2012, when Islamist groups from the country's north rebelled against the government and invaded the delta.

Many outside observers saw drought as an aggravating factor for the armed insurrection, which resulted in a French military intervention (CCS, 2012). But the drought conditions were largely the result of a long term trend of declining water flows into the delta due to upstream water abstractions.

In the face of fighting, many of the delta's inhabitants fled (IOM, 2013). Since people returned, following a peace deal agreed to between the government and the northern insurgents, they have found it hard to piece together their former lives. In early 2015, a new jihadi organisation called the Macina Liberation Movement, made up largely of Fulani pastoralists ('Macina' is Fulani for the delta region), began launching attacks on farmers in the Inner Niger Delta (HRW, 2015). And increasingly herders are in armed conflict among themselves over access to pastures (ICG, 2016).

In the northern part of the Inner Niger Delta, the now dried out Lac Faquibine floodplain system was once central to the wealth of Tombouctou and highly prized by nomadic fishers and pastoralists. There is strong evidence that the restoration of seasonal flooding here would improve human well-being and the local economy, as well as unite the different ethnic groups that have been in conflict here for decades (Hamerlynck, 2016). However, after three decades of broken promises to restore it, many young people are migrating (Brockhaus and Djoudi, 2008).

People-smugglers follow old salt-traders' tracks across the desert to the Mediterranean. Journalists have increasingly reported Malians among those in boats heading from Libya to Italy (Hinshaw, 2015; Smith, A.D., 2015).

The worst may be yet to come. Mali's upstream neighbour, Guinea, plans to construct the Fomi Dam, which will hold back much of the river's wet-season flow for generating year-round power. The Office du Niger, the Mali state agency responsible for extending irrigation projects upstream of the delta, wants to triple the irrigated area, once the Fomi Dam is completed. This extension would result in the loss of a further 250,000 hectares of grazing grounds. A recent assessment commissioned by Wetlands International concludes that the combined impact of these schemes could cut fish catches in the delta by 31 per cent and reduce the pastures by 28 per cent, with disastrous consequences for communities depending on these resources (Wetlands International, 2016).

**Restoration of seasonal flooding in Lac Faquibine would improve human well-being and the local economy, as well as unite the different ethnic groups that have been in conflict here for decades.**

**The combined impact of these (upstream development) schemes could cut fish catches in the delta by 31% and reduce pastures by 28%, with disastrous consequences for communities depending on these resources.**



Unless there are sufficiently large and correctly timed flood releases from dams in the Upper Niger Basin, these measures would create a new 'hydrological normal', similar to the conditions during the last major drought here in 1984, when three-quarters of the delta dried out and people fled en masse. More than a million people could be displaced (Pearce, 2012). With little chance of them finding employment within the country, many would be likely to head for Europe.

### Farming according to floods

Flood recession agriculture uses soils wetted by the annual inundation of floodplains, lake margins or seasonal wetlands by river flows. Farmers plant crops as the floods recede (Nederveen, 2012). It is an age-old and widespread practice in West African wetland systems (Richter et al, 2010; Adams, 1993). It was until recent decades practiced by around half a million people in the Senegal River Valley (Saarnak, 2003). It is also a prominent feature of the Lake Chad Basin (Batello et al, 2004; Loth, 2004). A cross section of the margins of the Inner Niger Delta illustrates the types of cultivation practiced in sequence from the upper, drier fields where crops include pearl millet, to the lower and wetter parts of the floodplain where flood resistant floating rice and bourgou are grown (Zwarts et al, 2009; Figure 4). To optimise the productivity of areas that are flooded annually, and secure at least two crop cycles per rainy season, both the rising and receding flood phases may be utilised.

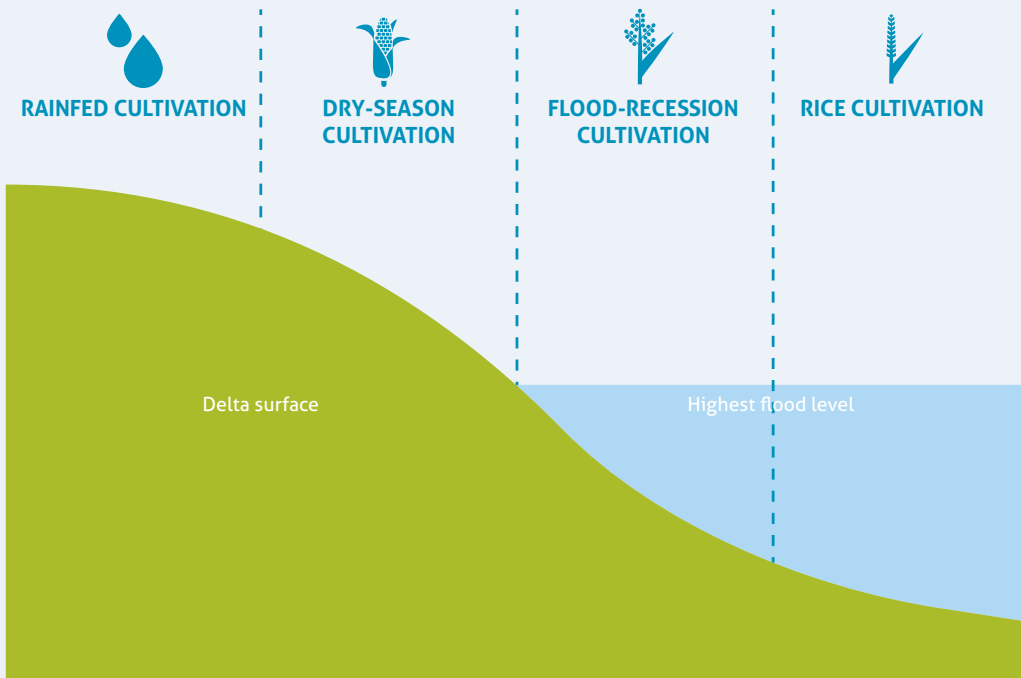
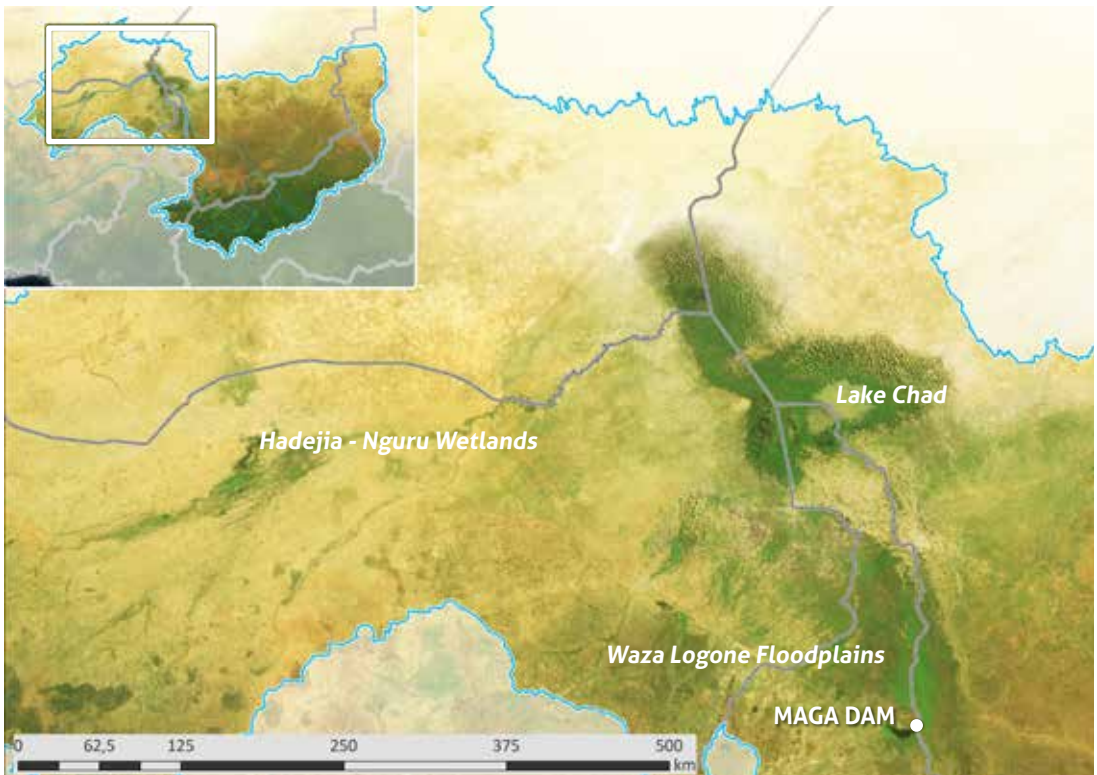


Figure 5: Types of farming systems at the margins of the Inner Niger Delta (adapted from Thom and Wells, 1987)



CASE STUDY:  
**LAKE CHAD**

*People displaced by the Boko Haram insurgency around Lake Chad take refuge in a camp in Geidam, Nigeria*



*Lake Chad and Chad Basin*

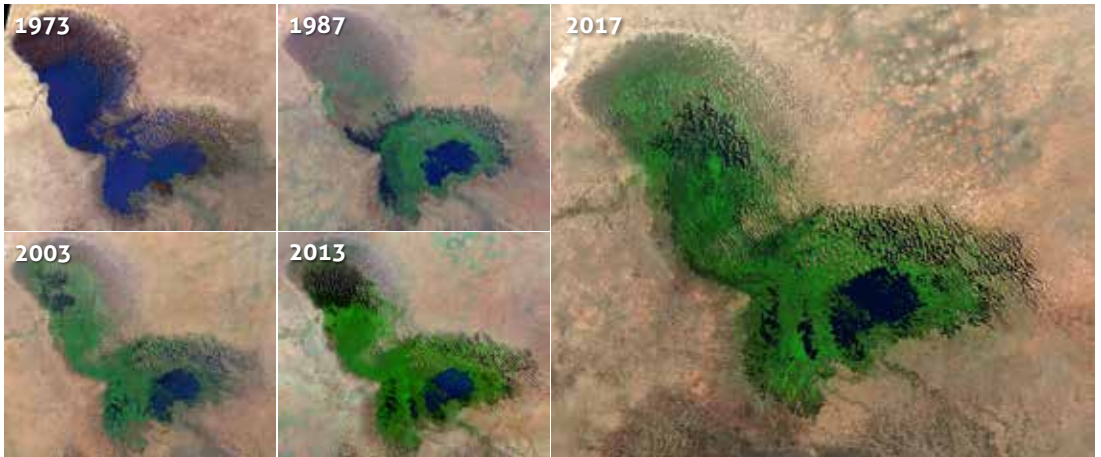
The headlines have been bleak. Boko Haram, the brutal Islamist insurgency based in northern Nigeria, has been killing and abducting people across the region around Lake Chad, where Nigeria, Chad, Cameroon and Niger meet. Fishers, farmers and pastoralists are fleeing in large numbers. More than 2.3 million people have been displaced since mid-2013, including 1.3 million children.

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Many have joined the million migrants who entered Europe in 2015, causing political angst across the European Union. There have been many calls in Europe to address the “root causes” of this exodus. But what are they? While poverty, civil conflicts and the spread of terror groups have all been blamed, the environment is rarely mentioned. And yet, on the ground in the Lake Chad Basin, few doubt that much of this mass exodus arises from environmental degradation.

**Few doubt that much of this mass exodus arises from environmental degradation.**

“Youths in the Lake Chad Basin are joining the Boko Haram terrorist group because of lack of jobs and difficult economic conditions resulting from the drying up of the lake and extinction of its resources,” Mana Boukary of the Lake Chad Basin Commission, an



*Changes in the Lake Chad system, as shown in satellite images over time. Blue areas in each image show open water. These satellite images clearly show the water is receding and the lake is shrinking (United States Geological Survey).*

inter-government body, told Deutsche Welle (Kindzeka, 2015). Toby Lanzer, the UN Humanitarian Coordinator for the Sahel, agrees. "Asylum seeking, the refugee crisis, the environmental crisis, the instability that extremists sow – all of those issues converge in the Lake Chad basin," he told an EU-African summit in Malta in 2015 (Carmichael, 2015).

Lake Chad is the remnant of a former inland sea, into which several major rivers drain. Its catchment stretches across eight countries from Algeria to Sudan. It has always been vulnerable to changes in flow from those rivers (Batello et al, 2004). The lake occupies a shallow depression, and is rarely more than four metres deep, so evaporation takes a heavy toll. In good times, the lake has spread to cover up to 26,000 square kilometres, but it needs constant supplies of river water to be sustained (Zwarts et al, 2009).

With progressively diminishing inflows, Lake Chad has lost 95 per cent of its surface area since the early 1970s. As a result, some nine million farmers, fishermen and herders in the region have faced water shortages, crop failure, livestock deaths, collapsed fisheries, soil salinity and increasing poverty.

Initially the lake's decline was largely due to long periods of drought in its drainage basin, and often drought continues to be blamed (ACTED, 2015). But rains in the basin have been mostly rising since 2002, whereas the lake remains stubbornly empty (Okonkwo et al, 2013). The reason is predominantly that the waters from the wetter south of the lake's basin, mainly flowing down the rivers Yobe,

**With progressively diminishing inflows, some nine million farmers, fishermen and herders in the region have faced water shortages, crop failure, livestock deaths, collapsed fisheries, soil salinity and increasing poverty.**

Chari and Logone in Cameroon and Nigeria, have increasingly been abstracted for irrigation projects (Zwarts et al, 2009). These projects aim to deliver economic development. But while the water has benefitted some, people downstream on these rivers, including those around Lake Chad, have been left high and dry (Coe and Foley, 2001).

The giant Maga Dam on the Logone in Cameroon has irrigated rice but dried up a third of the river's extensive floodplain, forcing thousands of pastoralists to seek grazing land elsewhere (GIWA, 2004; Loth, 2004). Meanwhile dams in northern Nigeria have all but dried up the Hadejia-Nguru Wetlands, depriving fishers, herders, flood recession farmers and others of their livelihoods. Up to 1.5 million people have been directly affected (Richter et al, 2010). In both cases, environmental economists have concluded that the expensive infrastructure has had an overall negative effect on local economies driving social breakdown, conflict and migration, culminating in the growing tyranny of Boko Haram.

Farmers in the region have traditionally been flexible in how they respond to the shifting shores of the lake. Entire villages pack up and move (Sarch and Birkett, 2000). For many years, this worked remarkably well. But the social flexibility has broken down.

A Nigerian government audit of the Lake Chad Basin in 2015 found that "uncoordinated upstream water impounding and withdrawal, land degradation, soil erosion, deforestation and bush burning," were in large measure responsible for ecological breakdown in the basin that "has created high competition for scarce water, resulting into conflicts and forced migration" (Nigeria Auditor General, 2015). Towns in north-eastern Nigeria have been especially badly hit. After massacres in 2015, the citizens of Doron Baga, once a quiet fishing community on the lake's shore, fled en masse to refugee camps over the border in Chad. But there was no safety there. In late 2015, suicide bombers targeted the fish market and refugee camp in the lakeside town of Baga Sola, and the Chad government declared a state of emergency in the region around the lake (Fessy, 2015; BBC, 2015).

The insecurity is ongoing. As recently as June 2016, the bodies of 42 Cameroonian, Nigerian and Chadian fishermen, killed by Boko Haram, were pulled from Lake Chad in Cameroon (Piggott, 2016). Without a revival of the lake, rivers and other wetland ecosystems, the region may have entered a downward spiral of environmental decay, economic decline, breakdown of law and order, and massive outward migration. Revival of those wetlands could offer the most direct way of reversing the tide.

**The expensive infrastructure has had an overall negative effect on local economies driving social breakdown, conflict and migration.**

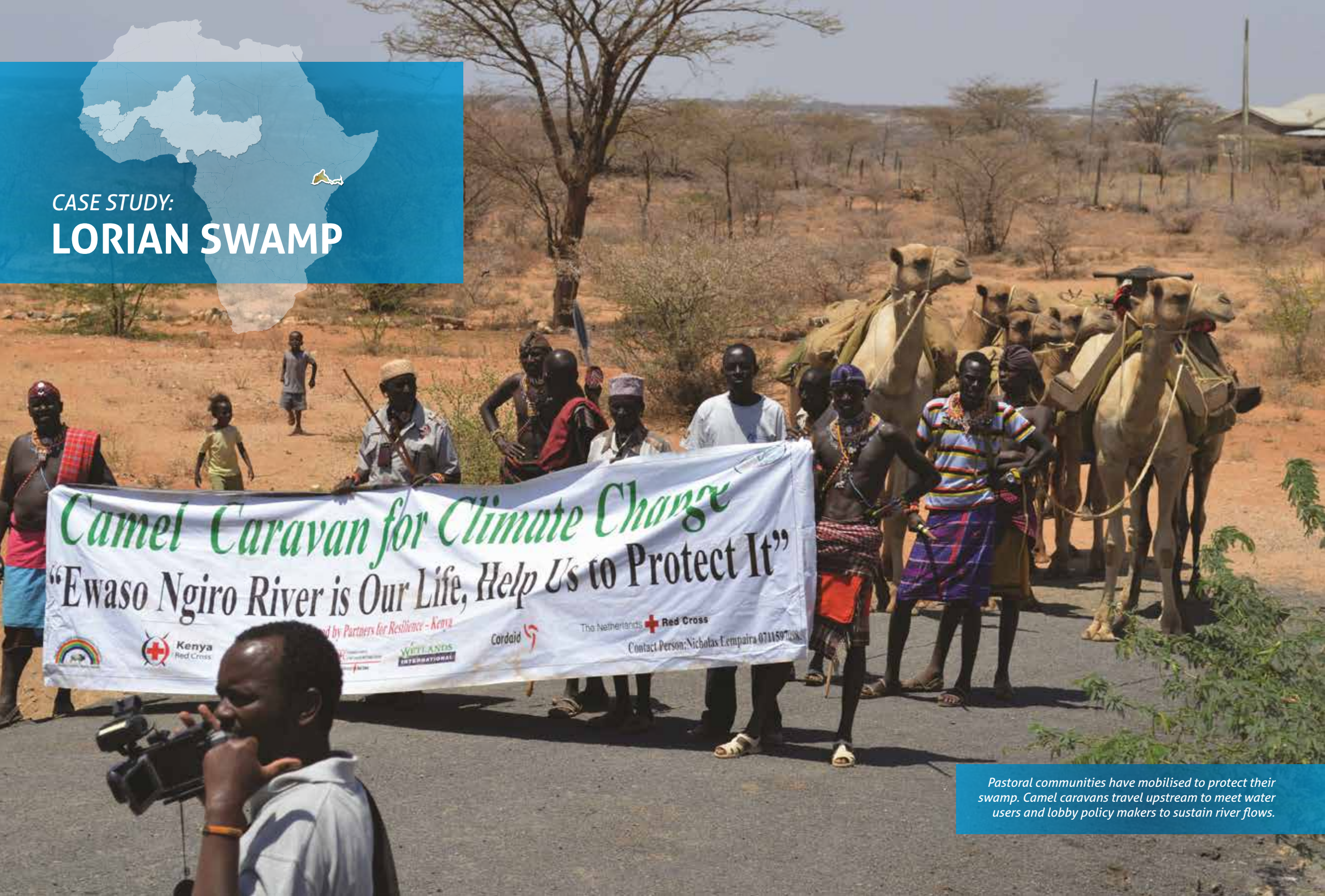
**Revival of wetlands could offer the most direct way of reversing the tide.**



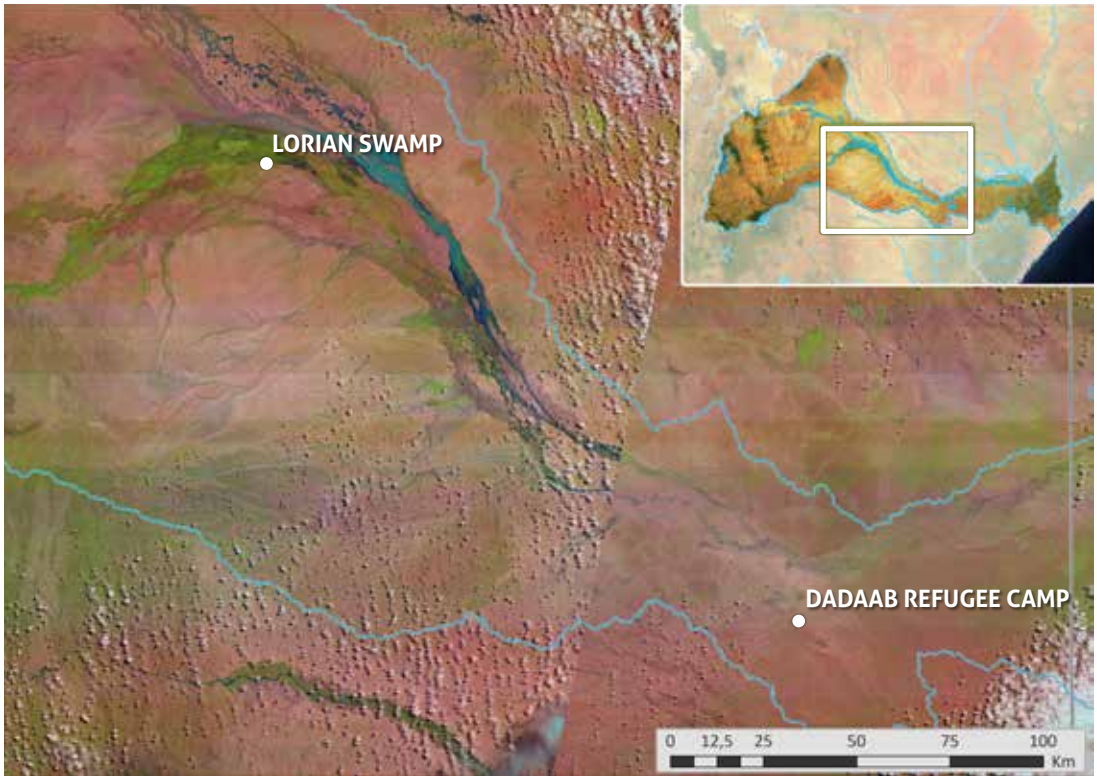
*People fishing in the Hadejia-Nguru wetlands*



CASE STUDY:  
**LORIAN SWAMP**



Pastoral communities have mobilised to protect their swamp. Camel caravans travel upstream to meet water users and lobby policy makers to sustain river flows.



*The Lorian Swamp, fed by the Ewaso Nyiro River, is part of a complex of rivers, lakes, floodplains and other wetland types. The Ewaso Nyiro River no longer reaches the Dadaab refugee camp because of agricultural and urban usage upstream.*

While Kenya does not form part of the Sahel region, the Lorian Swamp, one of Kenya's most significant wetlands, has been historically important for the survival of Sahelian pastoralists and their herds, including those crossing the border from Somalia. Because of this, and the recent role of the swamp in relation to Somali refugees, we decided to include it as an additional Case Study.

At its greatest extent, the Lorian Swamp covers some 2,900 square kilometres. It has long been an oasis for people and their animals, especially in the dry season (De Leeuw et al, 2012). But demands on the river and underground waters that sustain it threaten the swamp's survival.

The swamp is fed by the Ewaso Nyiro North River, which drains the glaciers of Mount Kenya and the eastern slopes of the Aberdare Mountains, and flows through the heavily populated agricultural region of Laikipia before expanding into the swamp, which has formed in a depression in the deserts of the country's arid east.

**The Lorian Swamp has long been an oasis for people and their animals, especially in the dry season.**



The river used to flow all year round, but since 1980 it has become seasonal for significant distances, stopping short of the swamp for 100 days in a typical year. This decline has been largely due to abstractions for intensive horticulture in Laikipia. Perversely, farmers are allowed to take more water during droughts when the river's flow is under most strain (Ericksen et al, 2011).

Deforestation and soil erosion have amplified the problems by reducing the river basin's ability to capture water in the wet season for release during the dry months. As a result, the river has become flashier, with occasional floods washing away homes, killing livestock and displacing more people. While the abstractions are delivering economic activity upstream, they are creating migrants on the river's lower reaches, including the swamp, while threatening the wildlife of the swamp, including birds and a large crocodile population (PACT, 2012).

Meanwhile, beneath the swamp, a large aquifer that helps sustain its hydrology has also been diminished by pumping of water to supply the Dadaab refugee camp on the edge of the swamp (Mumma et al, 2011). For many years the world's largest refugee camp, Dadaab has been home to people fleeing conflict in nearby Somalia. Ironically, by providing shelter for one group of refugees, it has risked displacing more people.

All is not lost. The camp is slowly being emptied. And pastoral communities are mobilising to protect their swamp by influencing upstream developments (Jebet, 2016). The Samburu, Turkana, Gabra and Borana people have organised Camel Caravans that travel upstream to meet water users and lobby for better water management. They are opposing plans for a new \$125 million dam on the river, the Crocodile Jaws Dam near Oldonyiro that will supply water and hydroelectricity for the proposed Isiolo Resort city (Wanjala, 2014). But with climate change a growing threat, the swamp's future – and that of those who depend on it – remains on a knife-edge.

**A large aquifer that helps sustain the swamp's hydrology has also been diminished by pumping of water to supply the Dadaab refugee camp.**

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IMPORTANT FOR HUMAN  
WELL-BEING AND THE  
REGIONAL ECONOMY.**



*Irrigated rice field along the southern edge of the  
Inner Niger Delta near Djenné*

# THE FUTURE OF SAHELIAN WETLANDS

Wetlands are centres of productivity and biodiversity across the Sahel. Flooding of wetlands is key to virtually all livelihoods in the region, sustaining agriculture, fisheries and pastoralism. Their extent and productivity are diminishing, however, as river flows are altered and flood peaks diminished, principally due to dams and water diversions. Droughts are now experienced more frequently. Some are effectively permanent.

The “squeeze” on the wetland areas and their natural resources has resulted in even greater pressures on the wetlands that remain, as well as on the surrounding drylands. Conversion of seasonal pastures to permanent irrigated agriculture and climate change further aggravate these trends. In some situations, traditional, local adaptation responses to drought have failed, escalating social tensions and the potential for violent conflict. The World Bank recently forecasted increased societal stress linked with rising water stress in the Sahel, with risks around water scarcity, climate change, extreme weather events and involuntary migration compounding each other (WEF, 2017). Our case studies show that ecological deterioration has in some places become a dominant factor in decisions to migrate, including to Europe.

The demise of wetlands has in recent decades seemingly been accepted as collateral damage in harnessing the region’s rivers for economic development. But their loss and degradation is now undermining that development, damaging critical natural resources, undermining rural productivity, accentuating poverty and contributing to streams of migrants.

While occupying only around 10 per cent of the surface area of the Sahel, wetlands are disproportionately important for human well-being and the regional economy. Their demise should be a concern to all those who seek to reverse the downward spiral of poverty and land degradation in the region. Unless the value of wetlands as natural assets is recognised, government strategies for development, and climate and disaster risk reduction will surely fail. And migration and conflict will intensify.

## Obstacles to action

Something must be done. Since it is predominantly the flood pulse that controls wetland productivity, the protection and enhancement of the pattern and timing of flows to wetlands, including seasonal floods should be a high priority.

**Ecological deterioration has in some places become a dominant factor in decisions for people to migrate temporarily or permanently elsewhere, including to Europe.**

**The demise of wetlands should be a concern to all those who seek to reverse the downward spiral of poverty and land degradation in the region.**

But first there is a problem of understanding. Both public and private investments need to recognise the benefits that wetland ecosystems provide, and the risks attached to degrading them. While the Sustainable Development Goals (UN, 2015), adopted in 2015, do acknowledge the role that ecosystems such as wetlands play in development and addressing climate change, the capacity of institutions to develop and implement the necessary integrated approaches lags far behind. It is made more difficult because many of the values and economic benefits of wetlands do not show up in national accounting systems and tax regimes. They are invisible.

**Many values and economic benefits of wetlands do not show up in national accounting systems and tax regimes.**

According to a recent review by the International Institute for Environment and Development (IIED), national governments in developing countries commonly lack the capacity to meet the requirements of international environmental and social safeguards for dams. As part of the solution, the authors call on basin authorities and commissions to assimilate and mobilise international good practice on dams through multi-country guidance (Skinner and Haas, 2014).

The Sahel is not alone in its reluctance to embrace the multiple values of wetlands. Nor in how development decisions are driven by a narrow range of utilitarian values, primarily the demands of energy and irrigated agriculture (Emerton and Bos, 2004; TEEB, 2013). But perhaps the consequences of these failings for water and wetland management are greater here than elsewhere.

A key obstacle is that management of wetlands has become disconnected from water resource management. As a consequence, the role of wetlands in supporting livelihoods and buffering water shocks is too often overlooked. An ecosystem services approach to water management could help reverse this (Lloyd et al, 2013). So could the more active engagement of local stakeholders, including the inhabitants of wetlands, in the design of development solutions.

**A key obstacle is that management of wetlands has become disconnected from water resource management.**

Even agencies with wide jurisdictions to manage both wetlands and agricultural investment, such as the intergovernmental OMVS on the Senegal River, often have no political responsibility for wetland conservation. They see the economic value of wetlands as, at best, limited to tourism. As the environment director of the OMVS put it in an interview for this report: "The agency was created to build dams for irrigation and hydropower and to regulate flows; it has no fisheries, pastures or ecosystems mandate." But awareness is growing. As Cheikhe Gaye of OMVS put it in an assessment of the Senegal River Basin, there is an "urgent need to increase the knowledge and awareness of important economic and ecological functions which the wetlands in the basin play" (Gaye, 2013).

This approach could have a profound effect on both investment priorities and the management of current infrastructure. Existing multi-purpose and hydropower dams should be operated with the ecological requirements of downstream wetlands, and the implications for wetland users, in mind. That would mean enhancing flood pulses. Likewise, the justification for new dams would have to be re-examined in the light of socio-ecological consequences. Demands for abstractions of water for irrigated agriculture would have to be balanced against the needs of fisheries, pastoralists and farmers engaged in flood-recession agriculture. Sustainable development has to be more than a catch phrase – more than a mirage in the desert.

**Justifications for new dams have to be re-examined in light of insights into the full picture of socio-ecological consequences.**

## **Opportunities for change**

There is a wealth of experience and knowledge that can help bridge the capacity gap, but it remains fragmented and dispersed. The Ramsar Convention on Wetlands is currently developing policy guidance on assessing the multiple values of wetlands, drawing on expertise and experience from all regions, for instance. And alliances between humanitarian, development and environment organisations have demonstrated how to empower local communities in the Sahel to improve their resilience to water shocks, through enhancing their environments and influencing policies and investments nationally and internationally.

While climate change has often been wrongly blamed for the decline of wetlands in the Sahel, international efforts to tackle its consequences open up opportunities for a rethink about the management of ecosystems. One helpful trend is the growing attention towards creating resilience to climate change, something which the UN Climate Change Convention's (UNFCCC) Green Climate Fund is committed to supporting. But a big question remains what form efforts to enhance resilience will take.

With temperatures set to rise, and uncertainty over future rainfall and runoff in the Sahel, there is a danger that governments will respond to fears of growing water shortages by constructing more dams and irrigation schemes. A combination of less rain and more dams could be devastating for wetlands. But policies should take a different approach, promoting connected social and ecological resilience.

**Policies should take a different approach, promoting connected social and ecological resilience.**

The last scientific assessment from the Intergovernmental Panel on Climate Change (IPCC) concluded that improving resilience to climate change can often best be achieved through protecting and enhancing natural ecosystems that provide a buffer against climate extremes (IPCC, 2014). Equally, the Sendai Framework on Disaster Risk Reduction (UNISDR, 2015), agreed in 2014, explicitly encourages

countries to strengthen the sustainable use and management of ecosystems as a way to build resilience to disasters.

Resilience is also a growing feature of international efforts to improve food security, for instance through the Global Alliance for Resilience (AGIR), which many Sahelian states have joined (AGIR, 2016). But again, there are questions about the form that investment in resilience and food security might take. Wetlands are longstanding sources of resilience in livelihoods and food supplies in the Sahel, especially for the most vulnerable. An effective AGIR in the Sahel should therefore work to sustain and enhance wetlands, and avoid strategies that damage them in the name of achieving food production targets. Food production is a necessary but not sufficient condition to ensure food security. More for some can mean less for others.

Efforts to boost food security and improve resilience to climate change must necessarily address the need to improve water security for vulnerable communities in and around wetlands. This means breaking with conventional policies, which have for too long been framed around investment in more dams and irrigation schemes, and meeting targets for drinking water access and sanitation, with little regard for how such approaches can undermine the water security of the most vulnerable.

The Economic Community of West African States (ECOWAS) has attempted to address these issues by promoting a regional policy on water resources that reconciles economic development, social equity and environmental conservation. A conflict prevention framework calls for governance of resources such as water to be “transparent, equitable, environmental-friendly and ensure balanced and sustainable development, social cohesion and stability” (ECOWAS, 2008).

ECOWAS also convened a regional dialogue that found many river-dependent communities felt their food security had been made worse by investment in infrastructure intended to improve it. Yet, ECOWAS has continued to argue that “the region has vast arable land available for exploitation and... river basins offer significant potential for irrigation”. Clearly ECOWAS needs to address such policy inconsistencies, and recognise the contribution that wetlands, and the livelihoods of their inhabitants, make to agricultural production and national food security (ECOWAS, 2011).

ECOWAS will have support in this. The current 2014-2018 Partnership for Environmental Governance in West Africa, implemented by the International Union for the Conservation of Nature (IUCN),

**Wetlands are longstanding sources of resilience in livelihoods and food supplies in the Sahel, especially for the most vulnerable.**

**International efforts to boost food security and improve resilience to climate change must address the need to improve water security for vulnerable communities in and around wetlands.**

aims at helping ECOWAS assert its leadership in the coordination of the regional policy on water resources. Targets include better implementation of environmental policies, stakeholder capacity building and a more open and decentralized governance of natural resources, including in the Niger, Volta, Senegal and Mono basins.

Other regional initiatives have the potential to help sustain wetlands. Among them is the Great Green Wall, a project of the African Union. The project was initially intended to plant a continuous barrier of trees between the Sahel and the Sahara Desert. But it has since been reshaped to promote sustainable land and water management as a means of addressing desertification, climate change, biodiversity loss and food security (GGW, 2016). It is appealing for climate change finance. To be successful in its aims, it needs to recognise that poor water management is an underlying cause of land degradation across the region, and to pursue wetland conservation and rehabilitation as part of its remit.

There is a similar worrying gap in understanding at the European Union. The EU recognises that land degradation, the loss of ecosystem services, and conflicts over natural resources all play a role in stimulating migration out of sub-Saharan Africa (EU 2016). And it has declared a wish to address this “root cause” of migration to Europe. But as of yet the underlying links to water management and the health of wetlands in the Sahel have not entered the discussion. This is a significant oversight. Similarly, the European Union Sahel Regional Action Plan seeks to address migration partly through investment in water access and sanitation. But the delivery of piped services is not enough. To be successful, the plan must also address the role of wetlands in ensuring reliable water access and securing local livelihoods.

In the Sahel, many river basins cross national borders and require transboundary management. Transboundary river basin agreements in Africa have suffered from weak institutional mechanisms and stakeholder engagement (Merrey, 2009). There is recognition of the need for a new approach. For instance, the Council of Ministers of the Niger Basin Authority declared in 2005 that: “The Niger Basin [is] a common space for sustainable development through the integrated management of water resources and the associated ecosystems, to improve the living conditions and prosperity of populations by 2025”. This is a sound vision, but is hard to reconcile with several current government initiatives in the basin, including the proposed Fomi Dam in Guinea, which could have a severely damaging effect on the Inner Niger Delta downstream in Mali.

**There is recognition amongst basin authorities of the need to build in ecosystem approaches, but implementation remains challenging.**

A programme funded by the Netherlands Embassy in support of the Government of Mali, aims to ensure "a living Niger Basin, where livelihoods and biodiversity are secured in a changing environment." It could change the terms of discussion about the dam by providing the knowledge base and decision-support tools for governments, while strengthening the capacity of civil society to engage in water governance (Wetlands International, 2014).

Besides intergovernmental initiatives, there is an equally urgent need to address sustainable water management at the local level – through agreements between upstream and downstream users, different ethnic and national groups, and nomadic, pastoralist and arable farmers. Such agreements could do worse than reproduce traditional informal arrangements that have been successful in the past at maintaining both peace and natural resources, despite often intensive use.

For instance, different ethnic groups in the Inner Niger Delta have long had informal arrangements to share the delta's resources. Herders, farmers and fishers have divided up their shared ecosystem according to their various needs. While the arrival of insurgents has disrupted these arrangements, they still have potential, and have worked even as populations in the delta have grown and water flow has diminished (Lamizana, 2010).

Wetlands International has been involved in supporting small scale projects in the Inner Niger Delta that help wetland communities manage their resources better while improving their livelihoods and resilience to water shocks. They have included market gardens run by women, small scale irrigation schemes, and projects to plant and protect bourgou grasses and flooded forests (Pearce, 2014). This bottom-up process offers a model for economic development in the Sahelian wetlands that builds on traditional knowledge of how these valuable ecosystems work. It may offer a way forward.

**Community-based approaches to improved wetland management offer a model for economic development that builds on traditional knowledge of how these valuable ecosystems work.**





## CONCLUDING REMARKS

Migration has always been a way of life in the Sahel. It aids the sustainable use of a fragile environment where fluctuating climatic conditions present life-threatening risks to people. Moreover, some degree of planned and proactive migration of individuals or groups within communities – especially if they send remittances home – may benefit households and populations living in and around wetlands.

Nonetheless, as our case studies demonstrate, shrinkage and degradation of wetlands caused by human interventions are incompatible with the sustainable livelihoods that their residents have developed over the longer-term. The result has been migration flows that may not be beneficial to either the wetlands or their inhabitants, and which have potentially grave implications for security at local, national, and even international scales.

To successfully promote human well-being and ensure food, water and energy security, to manage human migration, and to prevent conflict in the Sahel requires a radical reappraisal of the management of the environmental resources on which rural, and ultimately also urban communities depend. And the most important of these is wetlands.

*The annual crossing of the Niger River by herds is an important cultural event; women from the Mopti area, on the edge of the Inner Niger Delta, wear local ornaments.*

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