Chapter 1.
The regional system: environment, populations and resources

KEY POINTS

Before the Boko Haram crisis, the Lake Chad region could be defined as a regional system structured by migratory links and trade channels connecting more or less populated zones with high agricultural and economic potential to more fragile areas. Rainfall, presently midway between the precipitation of the wet decades (1950s–1960s) and dry decades (1970s–1980s), remains marked by sharp swings, which impact on the production of agricultural resources. In this environment, the most vulnerable zones—grazing grounds in northern Sahel and other agricultural and agro-pastoral areas (Borno and the Mandara Mountains)—are highly dependent on seasonal mobility to and trade relations with established population centres (Diamare, the Yobe River, and the Mundang and Tupuri lands) and recent migration areas rich in natural resources, such as Lake Chad and the Benue lands in the south of the study zone. The main urban centres are the two cities of Maiduguri and N'Djaména. They are both large consumer centres and hubs for long-distance trade relations. This system is resilient but vulnerable due to demographic growth, natural resource variability, and fragile political environments.

1. Hydrology and the environment

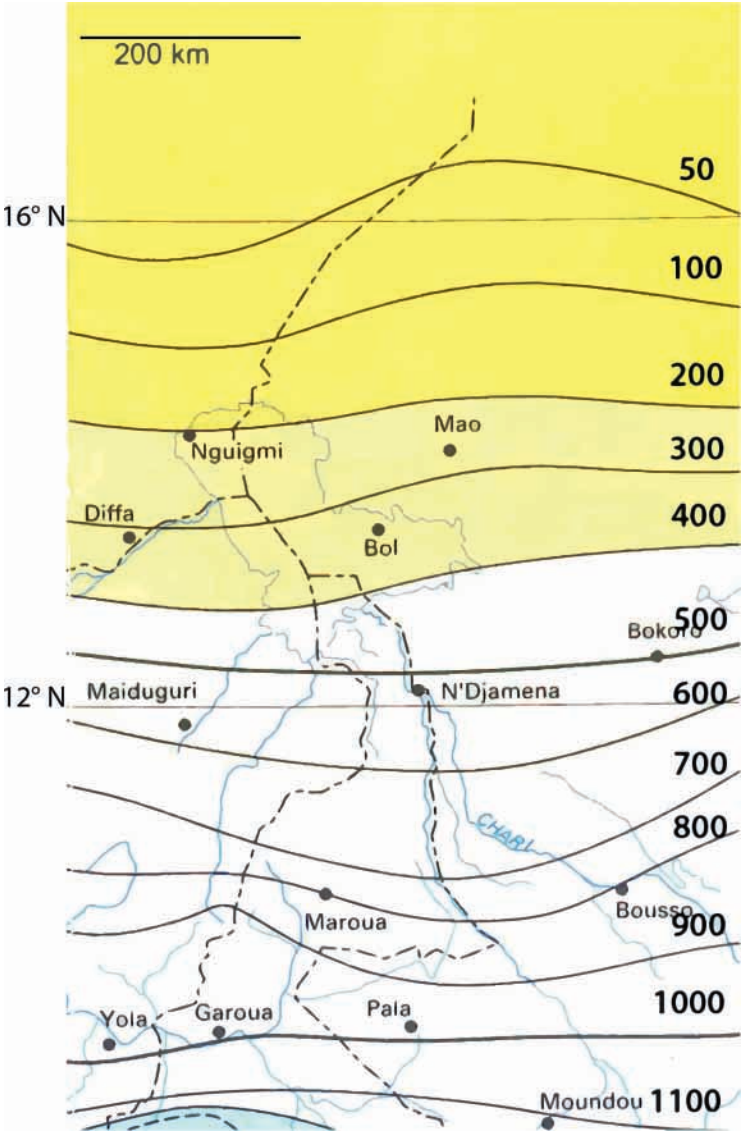
The climate and climate variability form one of the factors that condition the landscapes, ways of life, and societal stability. A good knowledge is required of rainfall and accessibility to the resulting surface water to understand the context behind a zone's socio-economic development. This knowledge is obviously insufficient on its own. Interaction with other environmental and social factors also needs to be taken into account.

1.1. The study zone along the rainfall gradient: Variability in space

The study region covers nearly 10 degrees latitude and presents a tropical climate on the whole, with one variably long and heavy rainy season depending on the latitude. Chart 1 displays the distribution of isohyets across the study zone for the 1951–1989 period: the rainfall gradient in the centre of the zone

is clearly marked, and a slight difference in latitude has strong impacts on the populations' survival on the ground. During the drought phase in the Sahel over the 1970–1989 period, the isohyets graduated south some 120 km from their wet period position (1951–1969).

Chart 1. North–south rainfall gradient in the study area (average 1951–1989, mm/year)



Source: L'Hôte & Mahé, 1996.

The names given to the ecoclimatic zones south of the Sahara vary considerably from one author to the next. The following ecoclimatic zones can be found running from north to south of the study zone, depending on whether the zones are defined by Le Houérou's terminology (1980) or that of the FAO/GIEWS[9] (1998). The latter are presented in italics:

- Saharan with less than 100 mm of annual precipitation in the north of the zone
- Saharo–Sahelian with total annual rainfall ranging from 100 to 200 mm
- Sahelian with 200 to 400 mm of precipitation (*250–500 mm*)
- Sudano–Sahelian with 400 to 600 mm (*500–900 mm*)
- Sudanian with 600 to 900 mm (*900–1,100 mm*)

The Guinean zone starts south of the Sudanian zone. The rainfall duration and quantity decrease from south to north.

This precipitation range, combined with the variety of types of soils and relief, gives rise to an array of natural resources and hence an extremely wide range of types of stockbreeding, fishing, and crop farming. Added to this variability in space is variability in time.

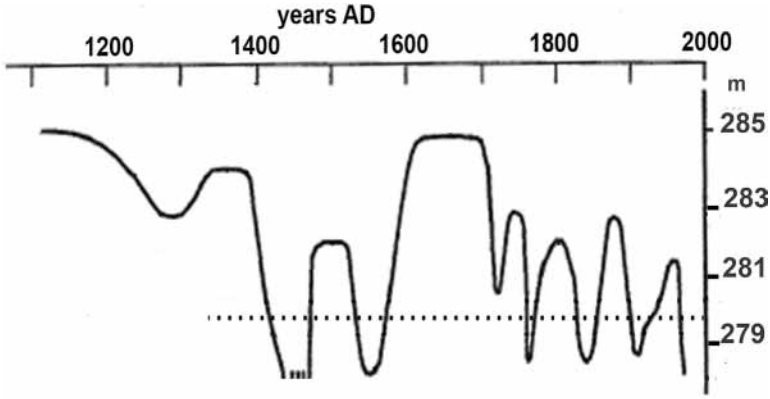
1.2. Rainfall variability by different timescales

The alternation of rainy and dry seasons across the area is dictated by the seasonal migration of the Intertropical Convergence Zone (ITCZ), which brings in moist air from the Atlantic Ocean with the monsoon. It generally rains south of this convergence zone, which moves northwards from approximately 8°N (8th parallel north) in January–February to 17°N in July–August. The volume of seasonal rain depends on the extent of the ITCZ's migration: the region north of the 13th parallel (corresponding to the latitude of the centre of Lake Chad) may receive rainfall for rainfed millet and good fodder growth in wet years, or not have any rainfall at all and consequently drive its inhabitants and their herds further south, as was the case in 1972–1973 and 1984.

This rainfall variability can be analysed by considering different timescales. Maley (1993) reconstructed an approximate historical scale of Lake Chad levels over the last millennium, producing an amplified picture of rainfall variability over its watershed (see Chart 2). There have been well-documented episodes of high lake levels in the past, alternating with phases of more average levels as observed today. Lake Chad's period of low levels in the 1970s and 1980s is not a unique event.

9 Food and Agriculture Organization of the United Nations/Global Information and Early Warning System.

Chart 2. Lake Chad level variations in past centuries



Source: Modified chart based on Maley, 1993

Annual precipitation over the Lake Chad Basin was calculated from data published by the Climate Research Unit (CRU, Harris *et al.,* 2014). The deviations from an average of 992 mm/year for the 1901–2006 period can be substantial. Three periods were identified, beginning with 1950 :

- 1950–1969: Wet period, often mistakenly considered a normal period, with precipitation (1,087 mm/year) higher than average for the century (992 mm/year);
- 1970–1994: Dry period, with an average 905 mm/year;
- 1995–2016: Return to an intermediate rainfall period (988 mm/year) close to the centennial mean. However, the returning rains did not bring an equivalent return in water level to the Chari River (the main tributary flowing into Lake Chad), for reasons as yet unexplained to our knowledge.

The majority (95%) of the rain that falls on Lake Chad's active drainage area is transferred back into the atmosphere by evapotranspiration (ET) (evaporation from wet surfaces and plant transpiration).

Average rainfall over the Chari–Logone Basin stood at 987 mm/year for the 1950–2014 period, representing an average volume of 603 km^3/year. At the same time, the annual discharge of the Chari River at N'Djaména averaged 28.4 km^3/year, just under 5% of the rainfall received. This implies the need for improvements to farming practices adapted to the different local circumstances in order to improve soil water retention and prevent loss through evaporation.

A first approximation finds that when precipitation P over the basin varies by 10% around its average value, the annual inflow Q to the lake from the Chari

River fluctuates by some 30%. The same holds true for the lake's water surface area. Lake Chad, like other closed lakes, is termed an amplifier lake: small variations in rainfall over its watershed generate large variations in lake level and surface area. In this respect, Lake Chad is an excellent indicator of the recent rainfall over its basin and across the entire Sahelian and Sudano–Sahelian area in general.

When considered in detail, however, an in-depth study of the abovementioned precipitation–discharge ratio showed that, for equal rainfall, the annual discharge has been nearly 30% lower since the early 1980s. The Chari–Logone system's hydrological behaviour has changed.

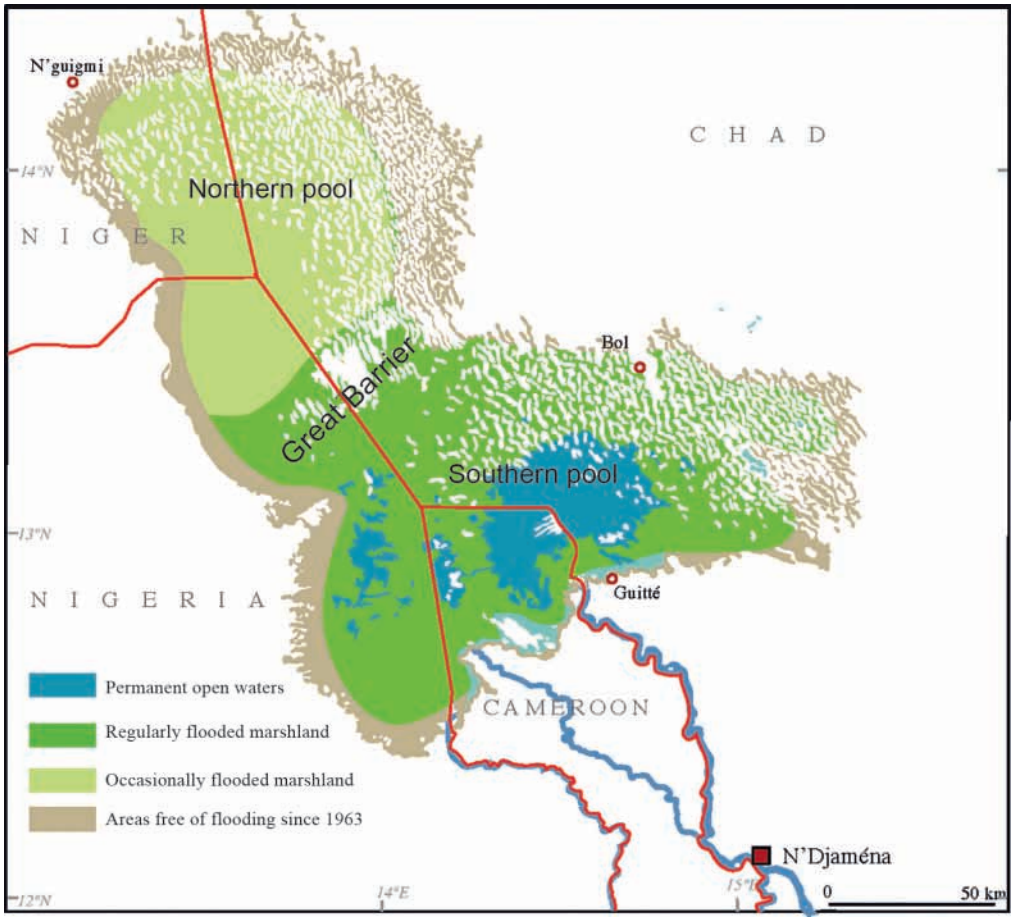
1.3. Lake Chad

Lake Chad's surface area and water level are dictated by the balance of inflows (inflows from the rivers and, secondarily, direct rainfall) and losses (mainly evaporation and infiltration towards the water table). Main inflows are from the Chari River (85% of the total), which in turn are dependent on rainfall over the basin. The other tributaries (Yobe, El Beid, and Yedseram) provide less than 10% of the water, with the remaining inflows being from rainfall over the lake.

Three major periods can be identified since 1950. The first is remembered as a period of content, while the second left its mark as an era of drought and societal disruption in the northern pool (see Map 2):

- 1951–1970: Large and Medium Lake Chad, with a body of water (20,000 to 25,000 km²) stretching from the Chari delta to N'Guigmi. A small indigenous population has been exploiting a moderate but sufficient resource, growing rainfed crops on the islands and surrounding lakeside. In Large Chad periods, water ran off from the lake via its outlet, the Bahr El Ghazai towards the north-east.
- 1971–1994: Small Lake Chad, comprising two pools separated by the emergence of the Great Barrier, with Dry Small Lake Chad episodes (northern pool dry all year) and substantial disruption (particularly to herds), especially in the northern pool and around the lake's periphery. Yet, whereas the lake's northern pool was subject to extremely high inter-annual variations, the southern pool remained relatively stable from one year to the next, with an increase in productive surface areas compared with the Medium Lake Chad. These variations in rainfall and the state of the lake brought immigration from the surrounding region (including herders who worked Lake Chad into their movements) and the internal migration between the southern and northern pools that was characteristic of the unstable Small Lake Chad.

Map 2. Schematic map of the main Small Lake Chad landscapes



Source: Lemoalle & Magrin, 2014.

– 1995–2017: Small Lake Chad, with the northern pool totally or partially inundated every year and therefore no major (water) crisis for this stable Small Lake Chad. Natural resources are abundant all over the lake, which consequently exports food products.

Considering access to the lake's natural resources as an indicator of the living conditions of societies living on the lake and lakeside, the recent period since the 1960s could be summed up by the abovementioned three periods, with a difficult 1971–1994 Small Lake Chad period consisting of partial, irregular flooding of the northern pool and drought years (1972, 1973, and 1984), which had a huge impact on the lake and its basin.

Since around 1995, the three activities (fishing, herding, and cropping) have been practised in the same places (multifunctionality) and often by the same families (occupational multiplicity), depending on the succession of conditions in the area and available resources. Resources are abundant, with a resource-sharing bottleneck due to the large size of the population.

Box 1

Controversies over Lake Chad's shrinkage. Why? Is it reversible? What is the solution?

First controversy: What is the lake's surface area?

Lake Chad is a shallow lake made up of areas of open waters and permanent, seasonal, or more occasionally flooded marshland. Estimates of the lake's surface area differ depending on whether the open waters alone are counted or the marshland areas are included. The illustrations of Lake Chad presented by NASA[10] (*Africa's Disappearing Lake Chad*, 2002, 2009) considered only open waters (approximately 2,000 km²), overlooking thousands of km² of marshland actively used for fishing and most of the lake's agricultural production from its seasonal floodplain crops

Hence this stated 90% shrinkage in the lake's surface area was widely taken as fact and endorsed the call for international aid to save Lake Chad, in particular by reviving an old idea of inter-basin water transfer from the Ubangi Basin to the Chari Basin under the name of Transaqua.

Lake Chad's lowest point occurred in May 1985, when the only areas flooded, covering approximately 2,000 km², were the zone in front of the Chari River delta and a few small areas of water in the southern pool. The annual average flooded surface area has stood at around 10,000 km² since the late 1990s, making the lake's current condition particularly good for lake productivity (fishing, agriculture, and stockbreeding).

Second controversy: Why has the water surface area shrunk?

In 2001, Coe and Foley published an article that attributed half of the decrease in the lake's river inflow to low rainfall and the other half to human action drawing off 10 km³ per year for irrigation. This figure is clearly mistaken, as such a volume of water would irrigate some 500,000 hectares (ha), which would most certainly be noticeable on satellite images and on the ground. More recently, a study for the Lake Chad Basin Commission (LCBC, 2012) estimated the water volume taken for irrigation from the Chari–Logone Basin and the lake at 0.6 km³ per year. The change in the lake's surface area is due to the variations in rainfall over its basin.

…/…

10 National Aeronautics and Space Administration, United States of America. See https://earthobservatory.nasa.gov/IOTD/view.php?id=1240

…/…

Third controversy: Long-term drying trend or climatic accident?

Reversible Small Lake episodes have occurred in the past independently of the present global climate change. So it is difficult to say whether global climate change has anything to do with the lake's current state.

Intergovernmental Panel on Climate Change (IPCC) forecasts for the coming century still lack certitude for the region covering the lake and its basin. Yet the highly probable rise in temperatures, and the possibility that rainfall will hold at around its current average, both increase the likelihood of low levels or total drying up in the lake's northern pool. Lake Chad is hence fragile.

Fourth controversy: Should an inter-basin transfer be set up from the Ubangi River?

The LCBC member heads of state tasked the LCBC with studying the possibility of channelling water from the Congo Basin to Lake Chad. Further studies are called for due to the many uncertainties surrounding the project (e.g. geopolitical, societal, environmental, impact on the lake's productivity). Moreover, the sheer scale of the construction work required is such that the project is monopolising attention at the expense of thinking on adaptation to climate change for fast-growing basin populations, who face potential drops in agricultural productivity as temperatures rise.

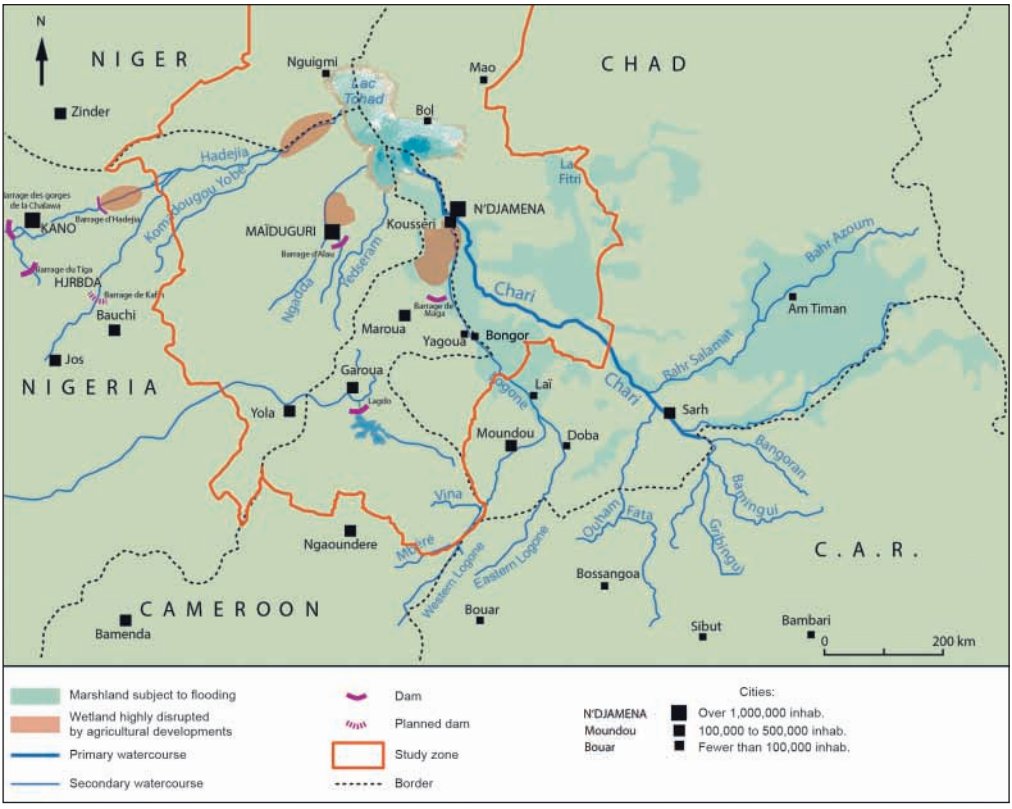
1.4. Other water resources in the study zone

The study zone's other water resources are watercourses: the Chari, Logone, Yobe, upstream Benue (including its tributary Mayo Kebbi), Yedseram, and Ngadda rivers to the south of the lake; intermittent streams in the Mandara Mountains (*mayos* in Fulfulde); floodplains (the Yaere in northern Cameroon, the overflow area from the Logone River to Mayo Kebbi [Olivry, 1986], Ba Illi plain, Massenya plain, and the Hadejia–Nguru wetlands on the Yobe River); and seasonal pools and subsurface water (see Map 3).

These water systems can be divided into a group of lands and sub-basins that can be developed and managed to provide services to the surrounding societies, factoring in potential upstream-to-downstream impacts and the area's intrinsic variability.

The Chari and Logone are two tropical rivers with one large, annual high-water period peaking in late October and a long-lasting low-water period centred around April–May. The current periods of lower low-water levels, longer than in the past, give the impression that the riverbeds are silting up. This needs confirming, since the few measurements available are inconsistent with this idea. With the exception of drought years, the rivers burst their banks during the high-water period and combine with the direct rainfall to flood the floodplains,

Map 3. Lake Chad's active watershed and wetlands



Source: Magrin, 2014a.

including the Yaere (8,000 km²) in Cameroon and the Ba Illi (up to 4,000 km²) in Chad. When the water level drops, the Yaere drains into Lake Chad through its outlet, El Beid, and into the Logone riverbed. In recent years, a huge number of new fishing channels have been dug by the inhabitants on the Cameroonian and Chadian banks between river and floodplain. They have altered the flood cycle calendar and the ecosystem services provided by these environments. Upstream of the Yaere, Maga Lake collects high water from the Logone River and *mayos* running from the Mandara Mountains, to release it into the Semry rice irrigation scheme area. This reservoir is also actively fished. In addition, the plains of Firki (Nigeria) and Diamare (Cameroon) are seasonally flooded and used to grow transplanted sorghum.

The Yobe River, rising on the Jos Plateau in Nigeria to the west of Lake Chad, feeds directly into the northern pool, but its discharge into the lake is small (less

than 1% of total inflows) with a low level of zero for 5 to 7 months. Downstream, it forms the border between Nigeria and Niger, and its water is used in part to irrigate red pepper fields.

The *mayos* run down from the Mandara Mountains and disappear into the Yaere without ever reaching the Logone River itself (Olivry, 1986). From south to north, the main *mayos* are Mayo Boula, Mayo Tsanaga and its tributary the Kalliao (the largest, with an annual flow of around 0.25 km^3), and the *mayos* of Motorsolo and Raneo. These *mayos* contribute to piedmont groundwater recharge.

The seasonal pools, broadly spread across the study zone, are important for livestock: they reduce the need to move herds to water, which helps the fattening process. Some of them have been deepened to improve their use.

In addition to the abovementioned Maga reservoir in Cameroon, there are few other dams in the Lake Chad Basin. In Nigeria, a few reservoirs in the upstream part of the Yobe River Basin are used to supply freshwater and irrigation. The main reservoirs are Tiga (2,000 Mm^3) and Challawa Gorge (900 Mm^3). Their operation has altered the natural high-water levels and calendars, interfering with farming practices and wetland ecosystems in the downstream Hedejia–Nguru wetlands. South of the lake, the Alau Dam (106 Mm^3) on the Ngadda River provides a small proportion of Maiduguri's supply.

In the Benue Basin in Cameroon, the Lagdo impoundment on the Benue River (7,700 Mm^3) is actively fished and used for electricity generation, irrigation in the valley (15,000 ha), and low-flow replenishment for navigation. Following heavy rains in 2012, the dam's floodgates flooded the valley, forcing the evacuation of 120,000 people in Nigeria and causing fatalities.

The Mayo Kebbi, a tributary of the right bank of the Benue, is part of the Niger Basin but is fed mainly by high-water overflow from the Logone River around Léré via the lakes of the Tupuri depression (Fianga, Tikem, and N'Gara), which itself is also fed by the Kabia in Chad. The Mayo Kebbi descends the falls at Gauthiot and joins the Benue River after crossing the Tréné and Léré lakes, where community fishery management projects have been developed by the German cooperation agency.

The Chari Basin's water table is found a few metres to a few dozen metres under the surface in areas where water table levels are low. Recharge is believed to occur under the dunes (Kanem), along the shores of Lake Chad and rivers, and in the lower part of the *mayos* of Cameroon. Despite recent measurements in Chad (LCBC-BGR,[11] 2014), the exploitable resource remains an unknown. Plans for new studies are under discussion.

11 *Bundesanstalt für Geowissenschaften und Rohstoffe* (Federal Institute for Geosciences and Natural Resources, German Cooperation Agency).

The Pliocene deep aquifer, at 270 m to 330 m depth with good-quality groundwater, is exploited by boreholes (sometimes artesian) in Nigeria and Niger, with a measurable impact on groundwater levels.

1.5. Other environmental aspects

The study zone is relatively flat. The low point is formed by Lake Chad, whose surface is at approximately 280 m, fed by the Chari River with its particularly low-gradient slope of 85 m for some 800 km between Sarh and Lake Chad. The few high points are situated on the southern edge of the study zone in Adamaoua in Cameroon, and more centrally in the Mandara Mountains, culminating at some 1,500 m between Maroua and the Nigerian border. More to the west of the study zone, the Jos Plateau (1,200 m) is the source of the Yobe River, with its equally very flat lower course.

A certain number of environmental characteristics and risks can be identified for the study zone as a whole, concerning in particular:

- Biodiversity and alien species
- Wooded cover, subject to intense harvesting for rural and urban families' needs
- Surface and subsurface water quality exposed to urban wastewater and an unchecked use of fertilisers and pesticides, especially sensitive since Lake Chad is the end concentration point for all products channelling through the water
- The risk of oil pollution, should operations start approaching Lake Chad and other stretches of water
- Conservation of protected areas and wildlife, despite the existence of national parks and reserves
- Implementation of the LCBC Water Charter.

There is a risk of introduction and spread of invasive plant species. The development of *Prosopis,* when the lake's northern pool dried up, is an example of this. The development of *Mimosa pigra*, a thorny shrub from Central America, is manifest on the banks of all the aquatic environments. However, the spread of *Typha* in the southern pool of Lake Chad and in the Hadejia–Nguru wetlands is not an invasion but a development due to stabilised water levels in an initially more changeable environment.

The Lake Chad Basin is so far one of the rare African river basins spared the water hyacinth. The introduction of this free-floating plant, found in the Congo basin, would be especially disastrous for all the basin's aquatic environments since they are shallow. Regular checks are therefore needed to ensure the plant has not taken hold.

As with all lakes, Lake Chad collects a certain amount of sediment every year from the rivers and wind. A research programme should be set up to evaluate past and present sediment loads and their distribution in the Chari River and the lake. This would usefully steer the LCBC's planned dredging work on the Chari River and lake to ease navigation.

1.5.1. Protected areas

The protected areas are important for a number of reasons: global biodiversity conservation, and earnings for the local populations and the governments (tourism and hunting rights). Good habitats for European migratory waterfowl along their winter migration routes and at their wintering grounds are essential to maintain their numbers.

Lake Chad in its entirety was declared a Ramsar site[12] for waterfowl conservation in 2008, with the Nigerian part designated as a national park.

The Logone River floodplain in Chad and the Tupuri depressions are other Ramsar sites situated in the study zone, which also includes the Mandelia Faunal Reserve (138,000 ha), with a high level of degradation, and the Binder-Léré Faunal Reserve with its manatees (135,000 ha).

In the study zone, protected areas cover a particularly large area in Cameroon. The North Region has three national parks, covering a total surface area of over 700,000 ha (Faro, Benoue, and Bouba Njidda) and the Beka forest reserve (3,500 ha). In these Sudanian savanna landscapes, protected areas, national parks, and hunting areas make up 45% of the region's surface area. There are seven protected areas in the Sudano–Sahelian steppe region of the Far North Region, including three national parks (Waza, Kalamaloué, and Mozogo-Gokoro) and four forest reserves (Laf-Madjam, Kalfou, Mayo Louti, and Mayo Sangué), which cover nearly 20% of the region's surface area.

In Niger, only a small part of the Termit nature reserve (10 million ha) is within the study zone.

In Nigeria, the study zone includes the Baturiya Wetlands Game Reserve on the Hadejia–Nguru floodplain and the Sambisa reserve, important for its connections with the Waza Park elephants.

All of these protected areas are exposed to a number of threats, including poaching, gold panning, encroachment by agriculture, transhumant livestock farming, and

12 The Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat, commonly called the Convention on Wetlands, is an international treaty adopted in Ramsar (Iran) on 2 February 1971 for the conservation and sustainable use of wetlands. It is designed to halt their degradation and loss by recognising their ecological functions and economic, cultural, scientific, and recreational value. The Convention came into force on 21 December 1975.

insecurity, all of which are due largely to a lack of resources for their protection. This encroachment raises questions regarding the considerable size of these protected areas in a context of sharp population growth and related land needs.

1.5.2. LCBC Water Charter implementation

The LCBC is an advisory body for the management of Lake Chad Basin water resources. It was set up in 1964 by the four countries bordering Lake Chad (Cameroon, Niger, Nigeria, and Chad). Libya and the Central African Republic (CAR) subsequently joined, and the Conventional Basin—the LCBC's operational zone—gradually grew to cover Lake Chad's current entire active watershed. The LCBC's aims seem ambitious given its human and own financial resources, rendering it dependent on external funding. Accordingly, it regularly hosts projects to develop the lake itself or its basin. More recently, the LCBC's mandate was extended to security (Magrin, 2014a).

The Water Charter of the Lake Chad Basin, adopted in 2012, laid down and revised the concerted management rules (LCBC, 2012). In practice, the governments can decide unilaterally on work or policies affecting the basin's water resources, as with the recent example of the embankments built on the two banks along the Logone River, which impaired the floodplains' ecosystem services. In other cases, joint decisions are made, such as the dredging of the Chari River and the project for an inter-basin transfer from the Ubangi River. Some of these initiatives are seen by the scientific community as lacking grounds in view of the available knowledge, but they are nevertheless supported by national and international donors.

2. Population dynamics and activities

2.1. Demographics: An African crossroads

2.1.1. The data

This section draws on the latest censuses for the four study countries conducted in the following years: Cameroon (1987, 2005), Niger (1988, 2012), Nigeria (1991, 2006), and Chad (1993, 2009).

These censuses present limitations specific to the zones studied in that a large share of the population is mobile (herders, fishermen, and even farmers) and therefore barely or not covered. Moreover, geopolitical problems may have distorted local results: insecurity in the Lake Chad area perpetrated by Hissène Habré supporters in the early 1990s prevented the 1993 census operations in the zone. At the same time, the Nigerian occupation of the Cameroonian side of Lake Chad (1987–2004) prevented an accurate count of the population in this area.

The main uncertainty concerns the population of the federated states of Nigeria. Although they definitely form the study area's main demographic centre, any accurate population measurement is complicated by the national political economy. The Nigerian Constitution stipulates an allocation key for oil revenues based on state and local government area (LGA) populations. This has led different censuses to overestimate or underestimate populations owing to rivalries and power struggles between territories and groups. Cameroon, also, has seen repeated controversies concerning the overestimation of population figures for electoral reasons in northern Cameroon (the area reputedly supports the ruling party in Yaoundé).

2.1.2. A highly imbalanced population distribution

The Lake Chad study region presents significant contrasts in population distribution.

The four Nigerian states alone contain over half of the population in the study area, the two North and Far North regions in Cameroon nearly one-quarter, the Chadian regions approximately 17%, and the Diffa Region in Niger a mere 3%.

Conventional wisdom might dictate that the population should generally follow a north–south gradient reflecting rainfall differentials: the Nigerien and Chadian Sahel–Saharan fringes are deserts (4.5 inhabitants per km² in the Diffa Region and 6.6 inhabitants per km² in Chadian Kanem), with settlement concentrated in Nigeria and Cameroon. However, the study area's historically sparsely populated southern edges—North Region in Cameroon—have still-moderate current densities[13] at around 40 inhabitants per km². This combines with a west–east gradient, as high Nigerian and Cameroonian densities (200 inhab/km² in Gombe and 140 inhab/km² in Nigerian Adamawa and Cameroon's Far North) decrease through to the east (60 inhab/km² in Mayo-Kebbi and a third of that in Chari–Baguirmi, both in Chad). On a small scale, therefore, the Lake Chad region looks more like a juncture between the high densities of West Africa and the less populated areas of Central Africa.

However, stark population differences are found at more detailed levels (see maps 4 and 5), reflecting local environmental conditions as they were experienced by the societies in the past and agricultural dynamics in more recent decades (sometimes endogenous and sometimes associated with development policies).

North-east[14] Nigeria is the most populous part of the study zone. The city of Maiduguri (0.9 million inhabitants in 2006, with a potential 1.5 million inhabitants

13 The figure on regional densities for this Cameroonian region does not take account of local pressure on natural resources owing to the large surface area of the protected areas.

14 Nigeria is divided into six geopolitical zones: Middle Belt, North East, North West, South East, South South, and South West. References to zones in the text are capitalised; references to general compass directions (e.g. north-east Nigeria) are lowercased and hyphenated. In historical discussions, former administrative divisions are capitalised.

in 2017)[15] and the Bornoan shores of Lake Chad post high densities, as do Gombe and Adamawa, which form an extension of the high Jos Plateau densities. The reason for this is found in the natural resources available and the Borno Empire's ancient shelter. To the north of Lake Chad, less advantaged in terms of rainfall, the kingdom of Kanem is also behind relatively high demographic densities at this latitude, concentrated between Mao, the wadi area, and the northern shores of Lake Chad.

In a highly populated Cameroonian region of the Far North, the Mandara Mountains have acted historically as mountain hideouts for populations fleeing forays by Fulani slave powers controlling the plains and have concentrated large numbers of people in small areas. Rural densities in this region are among the highest in Africa (at hundreds of inhabitants per km²).

The south of the Diamare plain also presents very high rural densities on both sides of the Chadian–Cameroonian border (Mundang, Tupuri, and Masa populations), as does the Diamare plain around Maroua. The reasons for these densely populated areas are found in their agricultural potential (transplanted sorghum plains, in particular) and strong 19th century political orders.

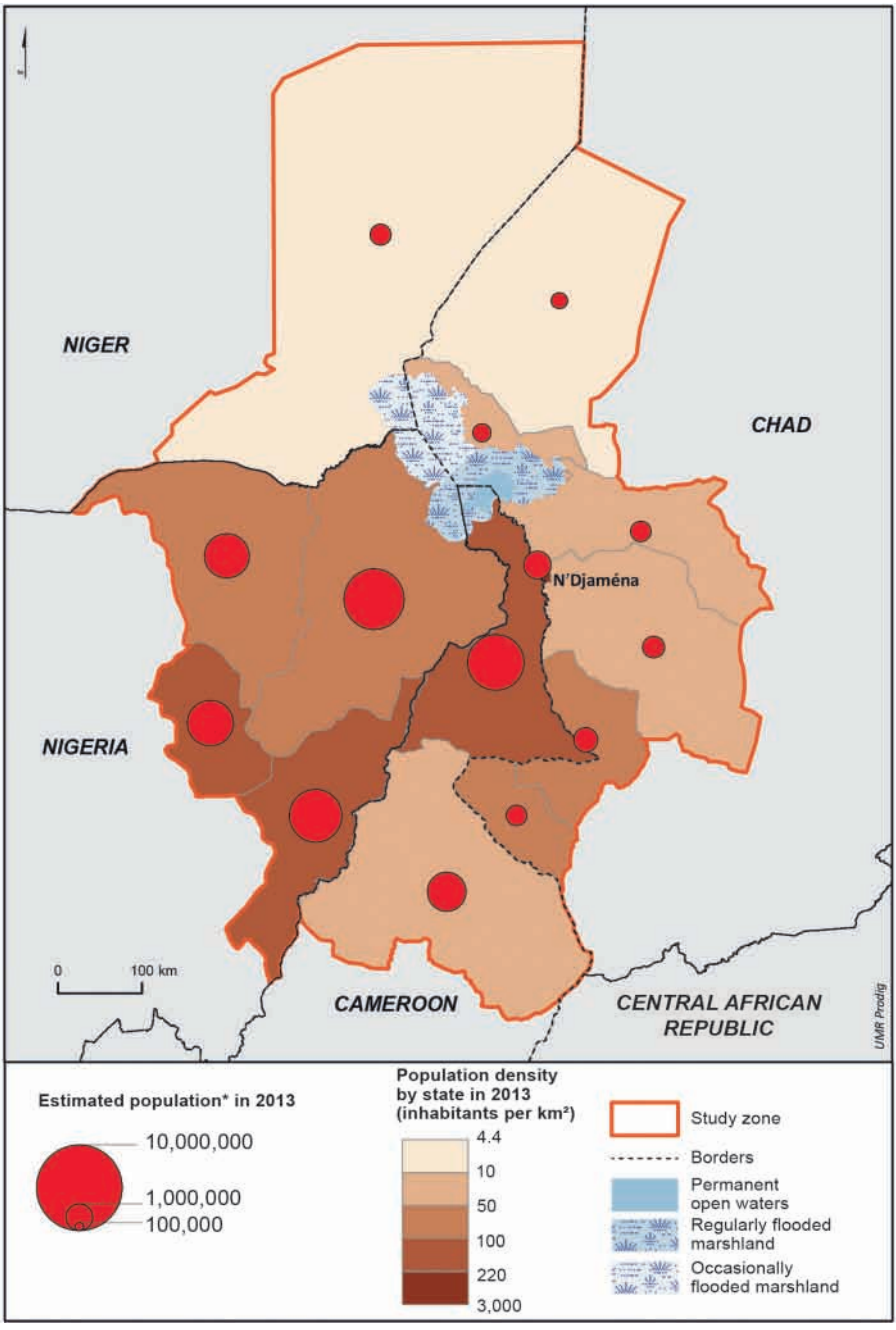
The valleys (Benue and lower valleys of the Logone and Chari) and certain wetlands (Lake Chad and the Yaere) did not historically establish large settlements in the Lake Chad region, with the exception of the polders of Kanem. They served as safe havens rather than centres of agricultural production. Today, they are often the prize in a race for land and water.

Lake Chad, its shores, and its islands today count some 2 million permanent inhabitants. It is a historically sparsely populated area, which long served as a shelter for populations rejecting Islamisation and the domination of Kanem and later Borno (known as Kuri and Buduma in French, and Yedina on the Nigerian side). These lake islanders long spread insecurity on the lake's shores, especially its southern shores, which remained deserted through to the start of the 20th century (Bouquet, 1990). Settlement of Lake Chad came in a number of waves starting in the 1950s (essentially fishing migration) and accelerated with the Sahelian droughts of the 1970s–1980s. The transition to Small Lake Chad freed up vast floodplain areas that could be used for agriculture and herding. The shores of the southern pool (Nigeria, Cameroon, and Chad) saw rapid settlement with the boom in highly productive agricultural systems trading on the urban markets of Maiduguri and N'Djaména.

In Nigeria and Chad, Lake Chad was a territory for major development projects beginning in the 1960s–1970s, but these encountered such problems (if not total

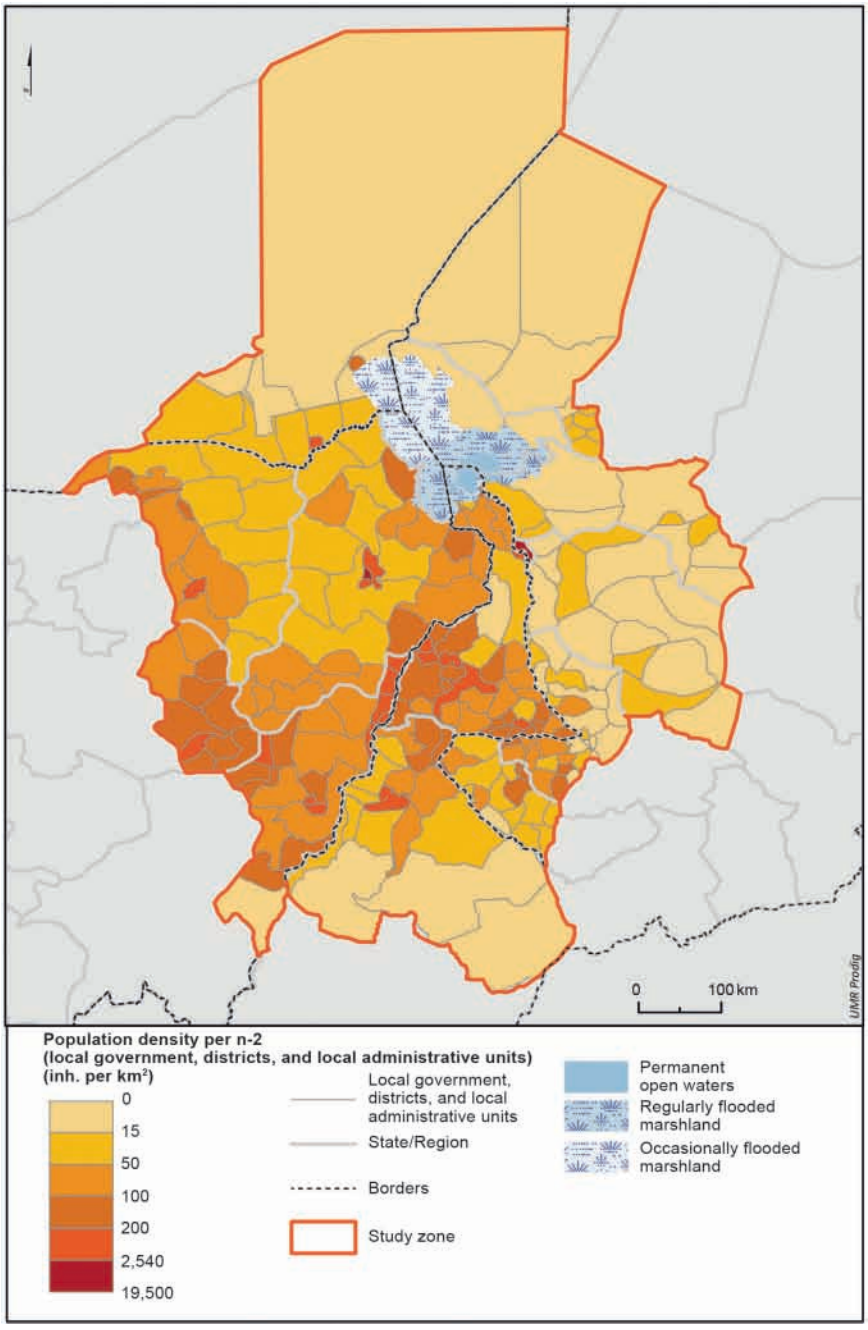
15 Including a number of internally displaced persons in April–May 2017, estimated at between 385,000 by the International Organization for Migration (OIM, 2017) and 640,000 by the United Nations.

Map 4. Population and densities by main administrative bodies



Sources: Estimates based on census data from Cameroon (2005), Niger (2012), Nigeria (2006), and Chad (2009).

Map 5. Demographic densities at the basic administrative level



Sources: Census data from Cameroon (2005), Niger (2012), Nigeria (2006), and Chad (2009).

failure in Nigeria)[16] that they cannot explain a migratory power of attraction associated with spontaneous settlement and agricultural intensification dynamics linked to urban demand. In the Logone middle valleys and the lower Chari valley (downstream of N'Djaména), hydro-agricultural structures—both public (Semry and Casier A rice-growing site) and private—have driven rural population densification that has been more spread out in time and space.

Lastly, in the south of the regional area, the Benue lands, historically sparsely populated Fulani chiefdom marches, have provided an entirely different type of pioneer frontier since the 1970s, based on rainfed cotton farming managed by the Cameroonian government in the form of the cotton development company, Sodecoton.

2.1.3. Strong demographic growth

The region posts very strong demographic growth on the whole, driven by high natural increase rates (around 3% per year). In the Diffa Region, growth is higher (+4.3% per year) than the national rate (3.7% per year) (République du Niger, 2008). In Chad, the average annual growth rate is +3.5% per year. In Cameroon and Nigeria, annual population growth is slightly lower (from +2.5% to +3% per year), but indicators are higher for the northern regions of the study zone.

An analysis of annual growth rates observed between the two most recent censuses reveals some interesting contrasts across the study region. Population growth was negative in Chadian Kanem (-0.8% per year) from 1993 to 2009, reflecting a high rate of emigration associated with the area's structural food and climate vulnerability. The highly populated areas of Nigerian Borno and the Far North of Cameroon hovered slightly above the natural increase rate (+3.2% and +3.8% per year), pointing to balanced, if not positive, net migration. The North Region's rate remained quite definitely positive from 1987 to 2005 (+4% per year) but slowed after the settlement peak of new farmers flooding to the cotton-farming pioneer frontier (+5.1% per year from 1976 to 1987). N'Djaména, the Chadian capital, posted an annual growth rate of 5%.

In 2017, population displacements due to the Boko Haram crisis invalidated any such projections. It is difficult to differentiate the proportion of displacements within an administrative space (e.g. from countryside to nearby regional capital) from those covering a longer distance. In the absence of large-scale extra-regional displacements, the easiest way to evaluate regional population growth is therefore to apply a uniform annual growth rate of +3%. This returns the finding that the regional population rose from 13.5 million inhabitants at the

16 The South Chad Irrigation Project (SCIP) and the Baga Polder Project, which were supposed to pump water from Lake Chad to develop tens of thousands of hectares, were in production only for a few years in the late 1970s: the receding lake waters and various dysfunctions quickly shelved the development (see Bertoncin & Pase, 2015).

previous census dates (on the cusp of the 1990s) to an estimated 23 million inhabitants in 2009 and 29.3 million in 2017. At this rate, the regional population will have doubled again in another 20 years.

2.1.4. A low level of urbanisation, nonetheless key to the regional system's order

The level of urbanisation[17] is low on the whole in the study area and lower than the national averages (except in Chad), reflecting the development situation. The level of urbanisation in the Diffa Region in Niger is 17% (21% national average) (République du Niger, 2008). The Cameroonian North (27%) and Far North (24%) stand at half the national average (51% in 2010). The level of urbanisation in the study area's Chadian regions is 35% (22% national average), but just 8.5% if N'Djaména is removed from the equation (République du Tchad, 2009). It is difficult to calculate the level of urbanisation in the Nigerian states, because the census provides only LGA populations with no subdivision for regional capital populations. Based on data from the Geopolis database, the urban population can be estimated at 51% in Borno, 42% in Adamawa, 34% in Gombe, and 30% in Yobe, making for an average of 41%, which is slightly higher than the national average estimated at between 40% (usual UN estimates) and 30% (Geopolis database, 2008),[18] depending on the sources. All in all, therefore, the urban population represents an estimated 33% of the study area's population.

The region's history reveals some very old but small towns, such as the Kotoko city-states on the Logone River levees (Makari, Mani, Goulfei, and Kousseri), the capital cities of Borno (Njimi, Ngazargamo, and Kukawa), and other ancient cities such as Mao (Kanem), N'Guigmi, and Yerwa (Maiduguri). The current urban network originated mainly in the principle of territorial control established by colonisation. Since then, state recognition of urban status has always coincided with the development of administrative functions, both of which combine to form an important factor for city growth. The post-independence territorial transition brought a densification of the administrative and urban fabric: in Nigeria, the formation of Borno State in 1976 saw the creation of new LGAs, each with a capital with urban status. The creation of the states of Yobe, Gombe, and Adamawa in 1991 saw the birth of new state capitals, even though their demographic weight is not always predominant. Damaturu, the capital of Yobe State, is much smaller than Potiskum to the west with its more

17 Share of the urban population in the total population. The definition of "urban" varies in the four countries considered. In Chad and Niger, the urban population is dictated solely by administrative status: any place established as a sub-prefecture (Chad) or department capital (Niger) is urban. The Cameroonian definition takes either the administrative criterion (district or arrondissement capital) or size (5,000 inhabitants) and facilities (public services and daily market).

18 The Geopolis calculation is based on an analysis of urban areas with over 10,000 inhabitants.

than 200,000 inhabitants (see maps 4 and 5 above). In the other countries, the post-1960 territorial dynamics saw a period of relative stability followed by the creation of new administrative entities, a process that has accelerated since the early 2000s with the further development of decentralisation. The number of cities has grown, but most remain small.

Besides their politico-administrative functions, the main driver of the cities' growth takes the form of their control of trade with their rural surroundings and cross-border trade, which represent the two regional economic powerhouses. Different combinations of these administrative–trade profiles can be identified:

- Maiduguri and N'Djaména indisputably lead the regional urban ranking, each with over one million inhabitants in 2012. Maiduguri is the long-standing north-eastern Nigerian metropolis. It controls and redistributes trade flows between Kano and southern Nigeria on one side, and Lake Chad, north Cameroon, and N'Djaména and Chad on the other. It is a major religious centre. It also has upper tertiary infrastructures (administrations, universities, and hospitals), but its industrial fabric is very limited. N'Djaména, the capital of Chad, concentrates the expected administrative and trade functions along with a few industries. Oil revenue investments rapidly transformed the city in the 2000s (especially after 2008). The city's modern services sector flourished (banks, telephony, and hotels), as did construction and civil engineering, which provided a large pool of employment.
- The second level of the regional urban hierarchy comprises cities with a combination of high-level administrative infrastructures, a large population (around 200,000 inhabitants), and a certain economic centrality (upper tertiary and industries). It includes Cameroonian cities (Garoua and Maroua) and Nigerian cities (Gombe and Yola).
- The third level covers cities with less comprehensive attributes but with at least one important function: Potiskum is a very important trade crossroads between the hubs of Lake Chad, Kano, and central and southern Nigeria; it is also one of the largest livestock markets in West Africa. Mubi, in Adamawa State, is largely comparable. Kousseri (an estimated 140,000 inhabitants in 2013) is a twin city to N'Djaména and the site of intense cross-border trade.
- The fourth level of the urban hierarchy concerns secondary cities with diversified functions (a more or less well-rounded administration, depending on how long the city has had its status, trade, and sometimes NGO headquarters and new universities). These cities centralise vast hinterlands, such as Diffa in Niger (18,000 inhabitants in 2010) and Bol, Mao, and Massakory in Chad (around 30,000 inhabitants each in the 2009 census); and well-populated spaces such as Pala and Bongor (some 45,000 inhabitants) and numerous LGA capitals in the Nigerian states.

– Last in the ranking is a fairly dense network of small towns resembling market towns in highly populated areas or areas with an agricultural economy and active trade.

2.1.5. Young Africa

The study region has one of the highest demographic growth rates and youngest populations in Africa, and therefore in the world. The median age in Niger in 2013 was 14.8 years old (United Nations, 2015), the lowest in the world.

The population's extremely young age structure creates huge needs in terms of access to services, especially education and health, and labour market integration. The "demographic dividend" on so many lips in recent years (Guengant & May, 2011) materialises especially where there is a sharp drop in fertility: to date, there has been no significant observation of such either in the Sahel or the study region. The total fertility rate is over 6 (6.7 in Nigeria's North East in 2011—NESTS, 2014: 155). This is due to a set of well-known causes: a high level of child mortality, a low level of education for girls, early marriage (31% of marriages before 15 years old in Nigeria's North East (NESTS, 2014: 156), and a low rate of modern contraception (93% of adults in Nigeria's North East use no contraception, as opposed to 53% in the South East (NESTS, 2014: 157).

Before Boko Haram, young people's poor employability and living conditions formed a driving factor for rural crime (Saïbou, 2010) and the business of violence, especially in Chad[19] (see Debos, 2013). Similarly, the hostage takings that seriously disrupted the Mbororo societies of Cameroon in the 2000s were partly the expression of a crisis of intergenerational relations (Seignobos, 2011; Chauvin & Seignobos, 2013), as is Boko Haram.

2.2. Spatial complementarities and rural dynamics

2.2.1. Rural dynamics in the Lake Chad region: Diversity and similarities

In the Lake Chad region, the vast majority of the population remains rural. The rural economy is still weakly diversified, mainly based on agriculture, livestock farming, and fishing.[20] Production forms are conditioned by the climate—with a climate gradient ranging from Sudanian in the south to Saharan in the north—the hydrology, the relief, and the soil conditions. The Sahelian wetlands, in

19 The cycles of rebellion observed from 1965 to 2009 were headed by leaders who rallied young people on ethnic bases. For want of success, the movements often ended with the negotiation of a coalition in return for positions in the administration and army for the leaders and their troops. Dissatisfaction in the face of broken promises and inequalities of access to resources drove many returns to rebellion.

20 Other activities using natural resources can be important locally, such as logging, hunting, gold panning, natron harvesting, leatherworking, and the production of spirulina.

particular, offer resources that can be used throughout the long dry season. The history of human settlement and powers also conditions the forms of control and access to land and natural resources—and therefore in part the forms of production. In rural economies now structured by food crops trade,[21] the distance to towns and cities and the quality of transport infrastructures give the region's agricultures an uneven dynamism, between the areas well connected to the regional cities, those relatively well connected to the southern markets, and the most remote areas. Investments in agriculture by urban entrepreneurs widen rural area inequalities and compete with family farming, still largely in the majority, for access to resources. Last but not least, agricultural policies have been implemented differently across the area.

The Lake Chad region also presents great similarities. Everywhere or nearly everywhere, livestock and agriculture—and fisheries in the wetlands—share the same areas. In the Sahelian zones, pastoralists historically rub shoulders with settled farmers who are also herders (or at least livestock owners). In the Sudanian zones, the two activities have really coexisted only since the 1980s. Herd mobility remains the basis of livestock farming. Agricultural land densification, climatic deterioration, and rising insecurity since the 1990s have even increased the need for cattle movements.

Everywhere, also, family farming is diversified (large array of animal and plant species). This diversity is as much a strategy to cope with price and climate risks as it is a way of enhancing complementarities between agro-ecological zones and between work and cash flow calendars. Agricultural produce processing, transport, and trade occupy a large number of men and women[22] and entail a wide range of levels of capital.

At study area level,[23] human and herd mobilities connect distinct types of areas and maintain complementary relations among them. We have identified four main types of areas:

- *(i)* Long-settled, densely populated spaces, which are agricultural product exporters, seasonal worker host areas, and resident sending areas
- *(ii)* Recently settled host spaces, which are agro-halieutic-pastoral product exporters, sometimes still with features of pioneer areas
- *(iii)* Vulnerable agro-pastoral areas, which are sources of migration
- *(iv)* Saharo–Sahelian areas which are used solely by pastoralists.

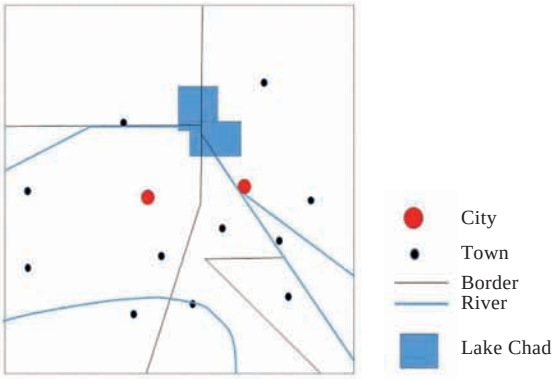
21 This food production is primarily intended for sale on national or regional urban markets but can be used for own consumption.

22 Further research would be useful to improve knowledge of these non-agricultural rural activities.

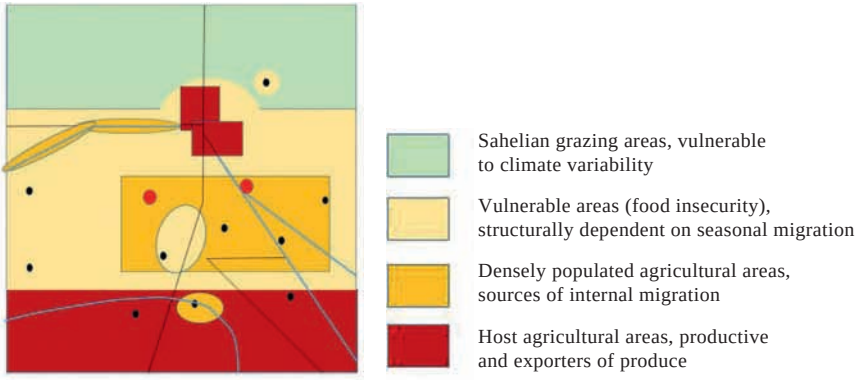
23 Note that the least is known about the situation in the Nigerian part of the study area; scientific literature on the agricultural and rural dynamics of Gombe and Adamawa is particularly thin.

Figure 1. The regional system prior to 2013

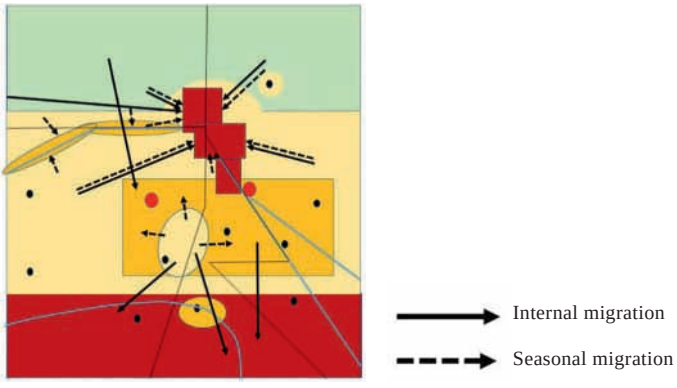
The regional system's centres and boundaries



Types of areas



Rural migration



Source: Authors.

The structure of the regional system is presented in chorem form (Figure 1), a schematic representation that captures the complexity of this territory and outlines the changes induced by the Boko Haram crisis. The chorem is used again in Figure 2 to analyse the system's destabilisation.

The system is based on the three regional centres comprising Lake Chad and the two cities of Maiduguri and N'Djaména and on the distribution of people and water, croplands, and grazing ground resources. In this system, the country's borders do not represent real boundaries, and the classic partitioning into agro-climatic zones is not sufficient to define functional complementarities, which also bear contrasts at more detailed levels. This situation partly explains why a crisis affecting one part of the region can have repercussions on a regional scale.

2.2.2. Densely populated areas exporting agricultural products and hosting seasonal workers

The spectacular development of cereal and market garden exports in response to urban demand in the second half of the 20th century was driven by a move to grow crops in the dry season—coping in part with climate variability—in the form of small-scale irrigation along the banks of the Yobe River (Niger/Nigeria), the Chari River (Cameroon and especially Chad downstream of N'Djaména), and seasonal watercourses (plains of Mora, Kolofata, and Diamare in Cameroon), as well as transplanted sorghum farming[24] on vertisol[25] floodplains (Firki plains in Nigerian Borno, Diamare plains and Benue Basin in Cameroon, the Logone and Chari interfluve and the Massenya plain in Chad). In the 1980s, climatic deterioration and the cotton development companies' financial straits turned these practices into the pillar of the local economy.

Competition on the land market exerted by urban entrepreneurs (traders and public officials) in these long-settled, densely populated spaces makes it difficult for the young generations to access land and encourages them to leave for host areas (Lake Chad and the Benue plains) or the cities. Added to this, in Cameroon, there is the problem of historical inequality and insecurity of land tenure: the traditional Islamo–Fulani chiefs force the Christian and pagan populations into renting land without any lease guarantee or into working highly one-sided sharecropping systems (Seignobos & Teyssier, 1997, 1998).

24 A real "green revolution" (as it needs no fertiliser), off-season transplanted sorghum growing has the dual advantage of *(i)* making use of flood-prone land reputed to be barren without the addition of fertiliser, and *(ii)* providing a certain amount of security from climate instability (because it is indexed to the rain budget). Labour-intensive fallow land gridding, coverage, and seeding techniques have developed less-suitable soils and claimed new land (Raimond, 2005).

25 Soil with a high content of expansive clay that gives it good retention qualities. This land is difficult to farm in the rainy season.

In the absence of fertiliser and input market regulation, the relatively high crop season expenditure involved in irrigation (motor fuel, fertiliser, seeds, and manpower) and in growing transplanted sorghum (hired labour for planting and herbicides) means that farmers have to work as hired labourers, or otherwise rent or sell the land they cannot farm.

Lake Chad Basin's major irrigation schemes—South Chad Irrigation Project and Baga Polder Project (Nigeria), Semry (Cameroon), and Bongor (Chad) schemes and what are termed modern polders on the eastern shores of Lake Chad (Chad)—initially designed with family farming specialisation in mind, came largely to nothing (see below), even though some schemes were integrated by farmers into diversified production systems and offered appreciable security against climate instability in certain years. The allocation of plots has largely benefited merchants, public officials, and other local high-ranking members of society—here too generating land inequalities and insecurity (Roupsard, 2000; Bertoncin & Pase, 2015).

2.2.3. New farmer host areas exporting agro-halieutic-pastoral products

Since the 1980s, Lake Chad and the Benue River plains have seen a steady flow of new migrants to their fertile land and lush grazing grounds. These areas are highly productive (maize, *niébé*,[26] livestock, and smoked fish from the lake; and livestock, maize, groundnut, and cotton from the Benue River plains). The migrants have managed to accumulate large surpluses from farming and fishing, often reinvesting in livestock entrusted to transhumant herders. With sharp demographic growth, land governance dysfunctions trigger recurring conflicts between users. These vary in their levels of severity and foster resource grabs in some areas (fish, grazing ground, and land) by the best-placed individuals in the economic and political circles of power (Seignobos & Teyssier, 1998; Raimond *et al.*, 2010; Rangé & Amadou, 2015). These conflicts are coupled with complex territorial conflicts, which are sometimes connected with political and citizenship issues (see Chapter 2, Section 3).

Lake Chad's catchment area stretches far beyond the study zone. In a post-drought context where the appeal of fishing is growing due to demand from the urban markets, fishers arrive from Senegal, Burkina Faso, Ghana, and Mali. Within the study zone's perimeter, they come from north-western Nigeria, eastern Chad, and western Niger to fish or farm for the season or settle permanently. A dynamic balance has set up in close interaction with the surrounding area between a highly variable environment marching to the beat of the water levels and productive systems based on occupational multiplicity, multifunctionality, and mobility (Raimond *et al.*, 2014b). Disproportionate exposure to water level changes means that Lake Chad's southern pool has seen steady demographic

26 Black-eyed bean.

densification, while the population in the northern pool has been more erratic. Along the southern shores, the growing agro-halieutic-pastoral overlap reflects an intensification of the productive process, generating remarkable economic performances (Rangé, 2016). The remoteness of the east, however, restricts its development possibilities.

The Logone floodplains form another large fishing–herding area that attracts herders in the dry season from Cameroon, Nigeria, and Niger. Fishing here has remained the prerogative of Logone River "natives", who migrate short distances along the river. Agriculture is secondary. The development of fishing channels has seen many recurring conflicts between transhumant herders and fishers, and among fishers themselves. As with Lake Chad, public policies more than water level variability are responsible for the huge uncertainty that hangs over the future of these wetland territories and societies, with thoughts of "refilling" the lake, damming the Logone River, and major agricultural projects (see Section 2 below).

In Cameroon, the Benue plains long remained sparsely populated but under the tight control of powerful Fulani *lamibé*,[27] until a massive wave of government-driven agricultural migration flooded in during the 1970s, followed by spontaneous migration from the saturated Sudano–Sahelian lands of Cameroon and Chad (Raimond *et al.*, 2010; Seignobos, 2010a). Competition to herding from the steady advance of crop fields has been exacerbated by the proliferation of declared game areas and the sheer scale of the conservation areas (covering 45% of the North Region). Conflicts among farmers, transhumant herders, and conservation administration can be extremely violent. Land mediation attempts have been made which, despite their limitations, are worth repeating (Seignobos & Teyssier, 1997, 1998; Raimond *et al.*, 2010). The Benue herding societies, weakened by the land tenure insecurity, experienced large cattle losses due to massive banditry in the decade preceding the Boko Haram crisis (see Chapter 2.3).

2.2.4. Vulnerable agro-pastoral areas, sources of seasonal and permanent migration

In the Sahelian zones, rain-dependent agricultural areas are vulnerable to climate instability, and so mobility is a historical coping strategy. In recent decades, the drop in rainfed crop productivity due to combined demographic growth and climatic deterioration has driven a growing number of young people to settle permanently in host zones or cities. In years of climate crisis, migrant remittances are decisive.

Herds are sent on transhumance to the Kadzell plains (Diffa Region), the Mao Region in Chad, lake hinterland in Chad and Cameroon, and a large part of

27 The traditional chief of a *lamidat* ("chiefdom" in Fulani or the chief's territory of command) is called a *lamido* in the singular and *lamibé* in the plural.

the study region in Nigeria. Men, especially young men, work the dry season on the lake, the Yobe River, or the transplanted sorghum plains. Most work as labourers. Those able to finance a crop season rent land.

In the long-settled Cameroonian Mandara Mountains and their Nigerian extensions, the populations historically developed sophisticated forms of production enabling extremely high population densities (Hallaire, 1991) at the cost, however, of a low return on their work. In the 1950s, the "mountain dwellers" descent to the plains contributed to an agrarian crisis precipitated by the droughts of the 1970s–1980s and climate instability (Boutrais, 1987). With the men migrating to the plains and cities, the women were left alone to manage the agricultural work in the mountains. Without secure land rights, they were no longer able to maintain the terraces (Seignobos & Teyssier, 1997).

2.2.5. Saharo–Sahelian solely used by pastoralists

Further north, in the Saharo–Sahelian zone (northern Kanem and the Diffa Region to the north of the Kadzell plain), agriculture is secondary and localised in natural depressions, or has even become impossible. Only mobile herding (camels, small ruminants, and zebu cattle) can make productive use of these resources that vary so much in time and space. Livestock numbers have shot up since the 1990s and the return of better rainfall conditions. Herding has become highly dependent on access to abundant dry-season grazing grounds in the wetlands (Lake Chad, the Logone plains, the flooded banks of the Yobe River, and basins in the Sahelian zones) and/or access to crop residues.

These herders are extremely exposed to variations in the terms of trade between livestock and cereals, which are particularly sharp and abrupt in climate crisis years. Levels of vulnerability, however, are highly disproportionate, since they depend on livestock endowments and the capacity to secure rights to resources and work. In the Diffa Region, for example, camel herders who travel to Lake Chad in the dry season earn enough for the young people to want to stay in herding. Those, however, whose movements are reduced are subject to high food insecurity and survive only through seasonal migration to the cities, the oil fields, or Lake Chad (Anderson & Monimart, 2009).

Among the impoverished herders, the disappearance of dowries of cows for women, which secured them their own capital, and the higher frequency of divorce has left some women in economic straits: the men's transhumance periods can become longer, forcing women to take on a larger share of the work without being compensated by higher status or more decision-making power (Anderson & Monimart, 2009). Smaller herd sizes have both reduced and deferred father-to-son livestock transfers, which in turn delays a son's independence. This situation fuels intergenerational tensions, which can lead to a break between the youth and elders.

Conflicts over access to grazing grounds and livestock wells, especially when connected with political and citizenship issues, are a major source of vulnerability. And these conflicts have been much aggravated by "modern" well projects blind to the question of resource rights (Thébaud, 2002). On the other hand, well-designed projects where water is seen as a governance instrument, such as the AFD-funded livestock watering projects in Chad over the last 25 years, can help secure new grazing grounds (Jallo *et al.*, 2013). The recurrence of certain agro-pastoral conflicts, around the Yobe River, and on the Borno and Yobe plains in particular, signals the need for a change of land arrangements between farmers and transhumant herders, and/or cattle movements.

2.2.6. Connected areas

Within this regional system, settlement migration connects vulnerable areas to those to which young people are forced to migrate by land constraints. Seasonal migration forms linkages between vulnerable spaces and the areas where farming and fishing offer employment in the dry season (as labourers or farmers).

Cattle are spread throughout the region in the rainy season but are more concentrated around Lake Chad and the Logone and Benue plains in the dry season.[28] Depending on time and place, the shared use of the space by farming and herding alternates between complementarities (herd grazing during flooding and floodplain cropping; and harvesting of crop residues for sale to herders) and competition (for access to rainfed uplands; and crop residue capture by farmers owning livestock).

Migration also connects rural and urban areas. Seasonal migration generally ties in with family economy diversification strategies, whereby young men take advantage of ethnic-lineage networks to find side jobs in the dry season (Iyébi-Mandjek, 2013). Given the very low school enrolment rate and small share of skilled urban jobs (see Chapter 2.1), settlement migration can be a way for young people to emancipate themselves from the authority of elders (control of productive resources, and decision-making power) in a context where their empowerment in the village and camps is compromised by land constraints and shrinking herd sizes.

28 For the sake of simplicity, we have not covered transhumance. Illustrations of part of these transhumance movements can be found in Seignobos, 2000a; Thébaud, 2002; and Réounodji *et al.*, 2015.

2.3. A crisis of agrarian societies?

2.3.1. Evolving agricultural practices that have proved effective

Dominant narratives on the Lake Chad region all too often continue to present farming communities as passive victims of repeated droughts, unsustainable demographic growth, and set "traditional" practices condemning the environment to degradation. Here, the finger points at the climate coupled with demography as the direct cause of the conflicts and supposed massive emigration.[29] Yet this view, which already guided the colonial administrators in the 1950s and continues to serve large-scale specialised cropping projects and agricultural firm projects, does not stand up to examination of the facts.

As we have seen, a few major export areas, in close interdependence with vulnerable agro-pastoral areas, provide a large proportion of the supply to the towns and two regional cities (Maiduguri and N'Djaména). The region also offers some of the most original and spectacular forms of production in Sub-Saharan Africa, allowing for sometimes extremely high population densities: the transplanted sorghum "green revolution"; erosion-control terraces and closely managed agro-biodiversity in the Mandara Mountains; close links between agro-halieutic-pastoral usages on the shores of Lake Chad; and so on. All of these practices represent real agro-ecological intensification, even if they are driven less by environmentalist concerns than a complex combination of know-how, resource rights, and price ratios.

The region's farming communities have also found effective long-term responses to a set of widespread changes occurring thick and fast since the 1970s–1980s (strong demographic growth, climate change, urbanisation, agricultural liberalisation, and privatisation of the cotton companies). New spaces were opened up to agro-pastoral colonisation with support from the cotton companies in Benue and entirely endogenously at Lake Chad. Herders changed their transhumance patterns, steering them to the wetlands and Sudanian savannas, and juggled species and races to rebuild their herds after the droughts of the 1970s–1980s, hence putting tougher grazing grounds to use (Seignobos, 2010a). Farmers adjusted their cropping techniques to develop new lands previously reputedly difficult to work (lowlands in the Sahelian areas, land regeneration using the *zaï* technique,[30] grids of levees to cultivate degraded vertisol, and high-water control systems at Lake Chad). They diversified species and cultivars (Raimond *et al.*, 2014a), combined small-scale irrigation with other water inflow systems, and recycled crop residues for animal feed.

29 This type of argument is found in the appraisals of the Lake Chad water transfer projects and appraisals of large-scale entrepreneurial agriculture projects.

30 *Zaï* is a technique that consists of digging micro-basins with a hoe to catch water and filling them with manure, and then dibble seeding millet or sorghum in the micro-basins.

During the same period, agricultural research stalled in the development of "drought-resistant" cereal cultivars (Seignobos, 2000a), while the large irrigation schemes ended in technical, economic, and social failures. Initially designed for agricultural specialisation, these schemes came up against a whole host of problems, such as soil salinisation, high production costs, marketing problems, land-use tensions, problems collecting on fees, and infrastructure deterioration. A string of "investment–deterioration–rehabilitation" cycles followed without any real success (Bertoncin & Pase, 2015).

2.3.2. Widening inequalities and crisis in rural society

This observation of the Lake Chad region's productive and innovative buoyancy does not, however, rule out the question of crisis in the agrarian societies.

In many regions, resumption of the same land-use conflicts (fishing channels on the Logone River floodplains and agro-pastoral conflicts in Nigeria and Benoue) are creating land insecurity and reflect profound governance dysfunctions. These dysfunctions benefit high-ranking political and business actors, who see them as opportunities to grab resources (Lake Chad fishing masters, major merchants, and public officials on the Benue plains). In certain regions, the land market also causes acute land inequalities, often to the benefit of the city dwellers who invest in agriculture (Diamare in Cameroon; irrigated banks of the Yobe and Chari rivers; and the countryside around Yola, Mubi, and Maiduguri). When land is rented without any guarantee on the lease, as is the case in Diamare, the rental market relegates the "immigrant" populations to land insecurity. Land inequalities and insecurity in the long-settled, densely populated areas confer a decisive role on the host zones (Benue plains and Lake Chad). These are coveted spaces for the traders and public officials, who are sometimes helped out by agricultural policy, as in the case with the agropole projects in Cameroon.[31] Aside from in Niger where the 1993 Rural Code has made for some progress, albeit not enough, land legislation in force in rural areas (Box 2) is inapt and encourages opportunistic behaviour by influential actors.

The value of pastoralism as the main activity for the sustainable development of natural, fragile, and variable Sahelian vegetation is widely recognised today. Yet only Niger has endorsed this in a law (Box 2). In Nigeria, the Acts of 1965 and 1976 establishing grazing reserves in the north of the country were never really enforced: only 113 of the 417 grazing reserves initially provided for were ever set up. Most of them were wiped out by advancing crops, poor upkeep, land speculation, local government negligence, and a proliferation of illegal constructions (Kuna & Jibrin, 2016).

31 Two agropole projects covering hundreds of hectares have recently been set up in Benoue.

In the Middle Belt, to where herders from the north have been expanding their movements since the 1970s, deadly conflicts between farmers and transhumant herders have also mushroomed over the last decade to indifference from political leaders (Higazi & Yusuf, 2017). Although the situation is less dramatic in Cameroon and Chad, there is no pastoralism code to date to give herders security. In the four countries considered, a question mark still hangs over the place of pastoralism in densely cropped areas and land-use priorities (conservation and oil projects).

Lack of regulation of the credit and input markets is also an important factor in socio-economic marginalisation. The lack of food market regulation played a large part in the last decade's food crises in Niger (Olivier de Sardan, 2008). Climate crises and temporary border closures also speed the pace of impoverishment and widening inequalities. Pastoralism is a classic example of these processes, with the transfer—following major droughts—of livestock from herders to city dwellers and wealthier farmers, relegating a large number of herders to the role of hired herder or forcing them to migrate to the city (Thébaud, 2002).

Box 2

Rural land legislation in the countries bordering Lake Chad

Post-independence land-use legislation, inherited from the colonial regime, established the principle of state property in francophone Africa (unregistered land is the property of the state). This legislation tolerates the rural populations' rights of use but denies the traditional authorities any official responsibility, aside from in Niger (recognised role in land-use conflict resolution). This legislation, developed on the private property model with the formal land title as its reference, relegates rural populations to legal uncertainty and illegality. It is inapt and has barely been enforced. Only Niger has reformed its land legislation. In Chad and Cameroon, the legislation in force dates back to 1967 and 1974, respectively. In Nigeria, the Land Use Act of 1978, still in force, assigns the management of rural land to the LGAs and state governors. Moves to reform land use are underway in these three countries.

Niger's Rural Code, adopted in 1993 after an extensive national consultation process, offers legal recognition of customary land tenure rights (Kandine, 2011). The 2010 Pastoralism Act rounded out the code, recognising herders' priority use rights on their "home grazing territories" and establishing pasturing areas. Land commissions comprising government representatives, traditional authorities, elected officials, and producer organisation representatives were set up at local level (villages, communes, and departments). Despite definite legal advances, the Rural Code suffers from enforcement limitations due essentially to the fact that the land commissions, structurally dependent on external funding, do not carry much weight compared with the traditional chiefs. Massive land purchases by elites (politicians and businessmen) and foreign investors also escape these commissions.

…/…

…/…

The draft code on private and state–own land being drawn up in Chad falls short in comparison (Berger & Cotula, 2015). It confirms the principle of the eminent property of the state over all unregistered land and it aims to transform customary rights into private property rights by making full legal protection subject to obtaining a land title. Yet it is now known that this transformation condemns young people, women, migrants, and herders to land insecurity. Land purchases by foreign investors are prohibited in frontier zones, but these zones are not defined. Pastoral matters were addressed by a separate bill passed by parliamentary majority, but withdrawn by the head of state (Idriss Déby) in late 2014 following protests by the opposition and part of civil society.

In Cameroon, the land reform underway is designed explicitly to facilitate land concessions to investors. Land reserves are being created to pave the way for major agro-pastoral projects (MINEPAT,[32] 2009). In addition, Cameroon granted the decentralised authorities natural resource management prerogatives in a 2009 decree, but the actual transfer of powers is a long time coming.

In Nigeria, a presidential technical committee on land reform was set up in 2009. Top of the agenda was the development of a land registry and formal land titles. A systematic assessment of land governance was recently conducted (Adeniyi, 2013). It is based on the Land Governance Assessment Framework (LGAF) developed by the World Bank in response to international demand for land and to promote the transfer of labour force out of the agricultural sector.[33]

Land inequalities and socio-economic marginalisation increase vulnerability to climate and economic change. There is a demand among the rural populations for more than new "technical offers". They need suitable land legislation, more price security, and easier access to credit and inputs, as well as transport infrastructures. This is why they are often in favour of the principle of contract farming (Roupsard, 2000). The cotton companies have in effect played a driving role in the development of the southern part of the Lake Chad region in Cameroon and Chad, mainly in terms of animal draught equipment and mechanisation. In recent years, some agro-industries (brewing and flour) have begun setting up in the region. Government intervention and aid agency support remain key conditions if family farmers are to benefit from the contract schemes (Burnod & Colin, 2013).

32 Ministry of the Economy, Planning and Regional Development.

33 http://www.worldbank.org/en/programs/land-governance-assessment-framework

3. Trade movements as powerhouse of the regional system

The Lake Chad region is structured by regional trade flows,[34] both internal and external. The region stands as an age-old trading space with its central location and position as a crossroads in Africa (Bouquet, 1990). As elsewhere in the Sahel, the economic dynamics of colonisation set in motion a territorial inversion: flows shifted en masse from their main focus of trans-Saharan trade with the Mediterranean to the Gulf of Guinea. This trend persists even though some reshuffling is underway due to the buoyancy of Sudano–Sahelian traffic and the Gulf of Guinea coming into competition with other seaboards (Bennafla, 2000). Within the study region, cross-border trade has grown steadily in density in recent decades, driven by multiple factors. Nigeria forms its mainstay as a location for the production and transit of globalised manufactured goods and a major consumer of agro-pastoral produce from the Lake Chad region.

3.1. Trade determinants

3.1.1. Differentials

Four differentials play a key role in the trade structuring this region.

The first differential is agro-ecological and has to do with the climate gradient between dry (Sahara and Sahel) and wetter lands (Sudanian zone). The importance in the region of age-old market channels making use of these complementarities was identified in the 1960s and described as an intermediate economic sector[35] (Couty & Duran, 1968). These channels prefigure the informal regional agricultural trade that is the economic powerhouse of the Lake Chad region's system today.

The second differential is demographic. It is the result of the existence of low population density spaces conducive to extensive stockbreeding (Niger and Chad), alongside high human density areas such as in Nigeria. Major external demographic and economic centres—Kano and coastal cities—exert predominant drawing power on the study region.

The third differential is monetary, already identified as a major consideration back in the colonial period (Chapelle, 1987). This differential was highly unstable following the period of independence, as the Nigerian currency fluctuated with a changing national economic situation influenced by oil prices—unlike the stable CFA franc (West African in Niger and Central African in Cameroon and Chad) tagged to the French franc and then the euro since 2002.

34 This section on trade movements does not deal with strictly local trade, such as trade in suburban market gardening produce.

35 Midway between a sector producing subsistence food and a modern economy concentrating on exports to the world market.

The fourth regulatory and customs differential exists between countries that are members of different regional organisations and do not always apply the same rules within one and the same organisation (ECOWAS[36] for Nigeria and Niger; and CEMAC[37] and ECCAS[38] for Chad and Cameroon). This gives the Lake Chad region the appearance of a complex hinge pin wherein regional integration hobbles forward (Magrin, 2014b).

3.1.2. "Bottom-up" regional integration

On the other hand, the Lake Chad region appears to be the theatre of real "bottom-up" regional integration (Magrin, 2014b) based on the weight and buoyancy of informal trade driven by market networks transcending the national borders.

The role of the agents in this trade is ambivalent. Different uniformed officers (military, customs, and forest officers) are omnipresent where trade circulates (border points, main routes, and markets), where they levy copious taxes with no legal basis. These taxes represent a large share of transport costs. They stand as a mark of everyday state (dys)functioning. At the same time, by adding to the price differentials, they can encourage smuggling and help make cross-border trade profitable for its operators. Consumers are the main victims of this, because they pay the price.

Among the official levies, customs duties are collected mainly on imported products entering through the ports of Lagos (Nigeria) and Douala (Cameroon), regional agricultural trade being taxed very little or not at all. Taxes levied on the markets on the basis of regional rural production provide decentralised revenues collected mainly by town councils and/or traditional authorities.

3.1.3. Trade scale-up factors

Trade has intensified in recent decades due to an increase in supply stimulated by growth in demand and improvements in communication networks.

As elsewhere in Africa, the boom in the locally marketed food trade has sometimes come in response to the crisis in the former export crops (groundnuts in northern Nigeria and cotton in northern Cameroon and south-west Chad) (Magrin, 2001). In northern Cameroon, for example, Diamare's groundnut, maize, and onion crops developed in this context. Agricultural intensification and wetland farming (transplanted sorghum plains, Lake Chad) have also contributed to meeting urban demand.

36 Economic Community of West African States.

37 Central African Economic and Monetary Community.

38 Economic Community of Central African States.

Growth in demand is the direct consequence of increasing urbanisation and changes to feeding habits in the cities, where the consumption of market garden produce and fresh meat and fish is rising. The upbeat macroeconomic situation of the 2000s also played a role in driving up trade of all the products: consumption was stimulated by the oil fields with the redistribution of their rent, especially in Chad. This commercial intensification dates further back in Nigeria.

3.2. Trade areas, places, and lines

The Lake Chad region's trade map can be read as structured by three hubs (Map 6): Lake Chad, first of all, as a rural hub turning out its large production of agro-halieutic-pastoral produce, but also a space driven by trade flows associated with the border-based differentials; and then the two major regional cities, Maiduguri and N'Djaména, each with over a million inhabitants, as centres of consumption and redistribution, mainly to and from the cities in southern Nigeria.

3.2.1. Output centres

The rural areas posted as net producers of agricultural products (*i.e.* producing more than they consume in a normal year) are often densely populated areas (partially irrigated valleys such as the Yobe River valley, the lower valleys of the Logone and Chari rivers, and the transplanted sorghum plains of Diamare in Cameroon, Massenya in Chad, and Firki in Borno) or are pioneer settlement areas (Lake Chad and Benue River plains).

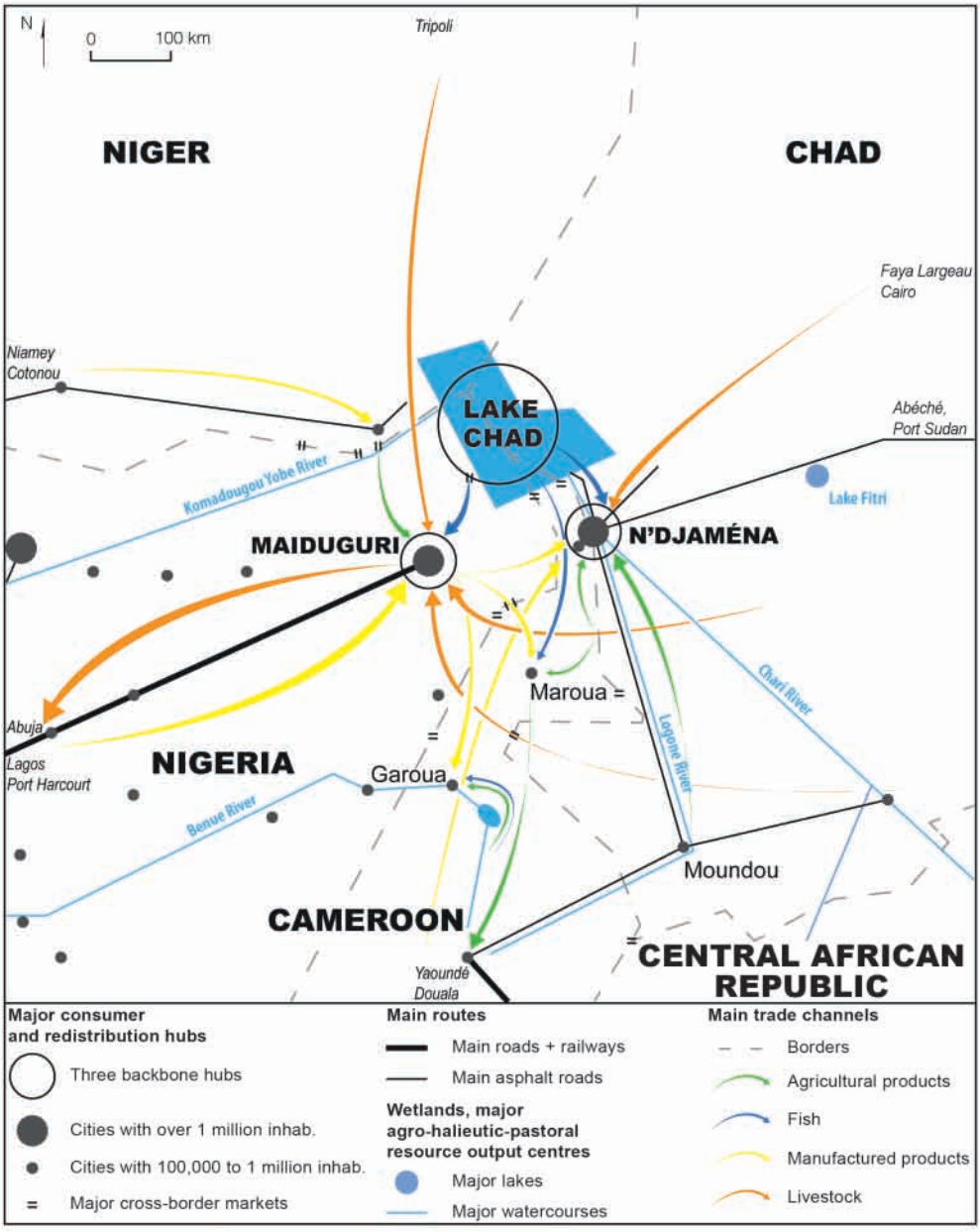
Trade circulating on the Atlantic seaboard–inland route includes manufactured products imported by the Nigerian and Cameroonian ports (mainly from Asia: motorcycles, telecommunications equipment, vehicles, etc.) and Nigerian industry production (smuggled fuel, soap, sugar, oil, brewing products, cement, etc.). Before the Boko Haram crisis, Maiduguri was the major centre for the redistribution of this merchandise to Niger, northern Cameroon, and Chad. Another channel supplies the region with manufactured products from the port of Douala via Ngaoundéré and the road to N'Djaména via Garoua, Maroua, and Kousseri. A third, minor route originates in Niger and the ports of Benin and Togo (second-hand vehicles).

3.2.2. Consumer centres and redistribution points

The large cities provide outlets for food and manufactured products, particularly Maiduguri and N'Djaména, but to a lesser extent also cities such as Mubi, Yola, Gombe, Potiskum, Maroua, and Garoua.

Border towns are important crossing trade points and often work in partnership either side of the border: Kousseri (Cameroon) and N'Djaména (Chad); Banki (Nigeria) and Amchidé (Cameroon); Gambaru (Nigeria) and Fotokol (Cameroon); Yagoua (Cameroon) and Bongor (Chad); and Figuil (Cameroon) and Léré (Chad).

Map 6. Pre-Boko Haram traffic driving a three-hub regional system around Lake Chad



Source: E. Chauvin.

Large urban centres and border towns have large permanent markets and warehouses to store production, hence playing a role in re-exporting to other towns, mainly Nigerian. These are the central points of the transnational market networks and hence the places of residence of the major traders heading the networks.

Alongside these major urban markets are found secondary urban markets and rural markets, generally weekly and often specialised in agricultural, livestock, and fish products. The rural markets play a role in collecting the production from their respective surrounding areas and in supplying the surrounding countryside with agricultural and manufactured products. The network of weekly markets has its own hierarchies and specialisations. Geographical location with respect to production areas, consumer outlets, and especially the main communication routes largely determines the hierarchy between these local agricultural markets. For fish in the Lake Chad area, Doro Léléwa in Niger, Darak in Cameroon, and Baga Kawa in Nigeria used to be nerve centres for smoked fish processing and sale. In livestock, Massakory (Chad) is a major market at the crossroads between Kanem, Lake Chad, and the transplanted sorghum plains to the north of N'Djaména. Mubi (Adamawa) plays an equivalent role in livestock in addition to making the most of a virtually tri-border position facing the Cameroonian border and not far from Chad. A similar position on the Chadian border is enjoyed by Figuil (Cameroon), a major trading centre for groundnuts (bought from northern Cameroon and across south-west Chad and sold depending on demand to southern Cameroon, Gabon, and Nigeria).

3.2.3. Transport

Although transport conditions are slowly improving in the Lake Chad region with the modernisation of infrastructures and the spread of new means of transport, the area remains marked by the poor quality of its network.

A number of appreciable improvements have been made in the passenger and goods transport sector over the last 60 years. In the lakeside area, outboard motor boats were introduced in the 1950s, gaining in speed and payload, without ejecting the less expensive, more manoeuvrable canoes. On land, railway tracks were laid in the 1960s–1970s between Maiduguri and the southern cities of Kaduna, Lagos, and Port Harcourt in Nigeria (1964), and from Ngaoundéré to Douala in Cameroon (1974). At the same time, the road system has improved, slowly, when the oil-producing countries' economic situations have allowed. The Nigerian network was largely surfaced in the late 1970s. The Chadian system has caught up since, tarmacking the N'Djaména–Guitté road in 1994 and the different roads from N'Djaména to Moundou, Ngaoundéré, Sarh, and Abéché in the 2000s. The spread of cheap motorcycles from Asia throughout the region in the 2000s came as a revolution in terms of access to mobility for country dwellers and inhabitants of outlying urban areas (Seignobos, 2014).

The Nigerien and Cameroonian road systems have not been improved to the same extent as in Nigeria and Chad. In Cameroon, Maroua is connected to the nearby towns of Garoua, Mora, Yagoua, and Mokolo by good-quality surfaced roads, but it remains cut off from the more distant towns (Kousseri, N'Djaména, and Ngaoundéré) due to the advanced deterioration of entire road sections (Mora–Kousseri and Garoua–Ngaoundéré). In Niger, the only major road in the study region is between Niamey and Diffa. The China National Petroleum Company (CNPC) started rebuilding the Diffa–N'Guigmi road in 2012, but the growing insecurity stopped work in late 2013. Beyond the town of Kinzayde (60 km east of Diffa), a very poor track leads 70 km to the lake. Some tracks enable traffic to circulate inside the lake's northern pool in the dry season, but only in years when the water level is low.

However, these national network quality differences call for some qualification. Although the Nigerian roads have been largely tarmacked, they are not well maintained and some roads have become quite impracticable, such as the north–south road from Abadan to Dikwa and the tracks around the lake.[39] In Chad, the roads along the northern edge of the lake are in a very poor state of repair between Massakory and Bol, and are even worse from Bol to the Nigerien border.

3.2.4. Merchant networks working the channels

The trade channels are operated mainly by regional and ethnic diaspora networks that have spread throughout the study region's four countries: Hausa, Kanuri, Arab, Fulani, and Fezzanian.

These networks are fairly stable. They already played an important role in pre-colonial trade, in association with the forest zone regions and the trans-Saharan trade channels through to the Mediterranean. Hausa and Kanuri set up in trade outside Nigeria long ago, mainly along the pilgrimage route to Mecca and as the centralised pre-colonial states expanded. In the 19th century, traders arrived in the region from Libya and Sudan, acting as middlemen in trade with Arab countries (kola, skins, etc.) (Igue, 1995). In the same period, Fulani and Kanuri merchants, well established in the *lamidats* of northern Cameroon, extended their networks into neighbouring areas.

In addition to their ethnic identities, the merchant networks are structured by a business rationale of response to changes in production, markets, and outlets. They play on their origins, being quick to claim membership of one community or another as the opportunity arises. These merchant networks have

39 The same situation is found for the Ngaoundéré–Garoua and Maroua–Kousseri roads, which are old, rarely repaired asphalt roads. Repair work has been carried out on the Garoua–Maroua road on a number of occasions, the last time being in 2010.

their connections with the national and local corridors of power in the shape of clientelism and political support.

Other players are involved in regional trade. Networks of female traders specialise, for example, in the sale of fruit to N'Djaména, Bongor, Léré, and Pala (Chad). Some traders have recently migrated to the Lake Chad region, such as the Arab refugees from Ati who fled the repression of Hissène Habré's regime in the 1980s. In a more cross-cutting manner, the development of locally marketed food, off-season crops, and market gardening produce is increasingly encouraging producers to sell their harvests directly on the large permanent markets.

3.3. The main trade channels

3.3.1. Leading agricultural surplus area channels

Many flows are sent to the cities and production deficit areas from the most productive, dense, and migrant host areas, mainly along the shores of Lake Chad and the plains of the Benue and Logone rivers.

At the lake, flows from the southern pool are greater than from the northern pool.

The northern pool suffers from its poor accessibility by road and its remoteness from consumer centres. Products are nonetheless sold *(i)* to N'Djaména by traders and via the sales of the Lake Chad Development Company (SODELAC) to the National Office for Nutrition and Food Security (ONASA); *(ii)* to the north (Kanem, Bahr El Gazal, and Borkou) and Niger, often on camelback; and *(iii)* to Nigeria and Cameroon across the lake by canoe (Magrin, 2015). Larger flows from the southern pool take better transport routes. The vast majority of production from the lake's Nigerian shores goes to Maiduguri, Chad's production to N'Djaména, and Cameroon's to Kousseri and Maroua. Despite its demographic weight, Nigeria does not absorb all the lake's production, as prices are sometimes lower on the country's markets than in Cameroon and Chad, especially for cereals. The Nigerien region of Diffa is nonetheless more clearly oriented towards Nigeria, with flows of black-eyed peas, onions, and peppers.

The Logone River plain produces primarily rice, market garden produce, and dasheen (Kim country), sold mainly to N'Djaména on the Chadian bank, and Maroua and Kousseri on the Cameroonian bank. South-east Chad exports groundnuts, maize, and onions (from Binder) to the Cameroonian cities for the Nigerian and Cameroonian markets. The North Region exports maize and groundnuts to southern Cameroon. Cotton is also exported to the south and the Cameroonian coastal ports.

3.3.2. Heavy livestock channels

Nigeria and its cities form the main outlets in the Lake Chad region for heavy livestock and trade in skins.[40] Maiduguri is the major regional centre for assembling livestock and sending them on by train to Kano, Lagos, and the other cities of Nigeria (Ilorin, Onitsha, Jos, and Ibadan). A string of markets on the Nigerian borders pick up the flows from the neighbouring countries: Geidam, Damasak, and Malam Fatori on the Niger side, and Gambarou, Sigal, Djilbé, Banki, Kerawa, Mubi, and Sorao on the Cameroon side.

Flows are channelled into two or three main routes to Nigeria:

- Livestock from Niger is sent from the north to N'Guigmi. The routes then fork off to markets alongside Lake Chad (Karamga) and those east of Diffa (N'Guiel Kollo).
- Chadian livestock, reputedly by far the largest flows in the region, enter Cameroon by three main routes: *(i)* the northern route via the markets of Massakory, Karmé, Dourbali, and N'Djaména, and through Ngueli to Gambaru; *(ii)* the central route through the markets of Guelendeng, Abba-Liman, Bongor, and Léré to Banki; and *(iii)* the southern route from Pala-Doumrou to Mubi. The animals sometimes come from far-flung areas to feed the Nigerian giant, including from Roro, one of the largest livestock markets in Chad, situated in the Moyen-Chari Region at the juncture of the Sahelian pastoral space, the Salamat Region, and southern Chad.
- Cameroonian livestock, whose numbers are sometimes supplemented by herds from Chad (if not, by extension from CAR), cross the north of Cameroon, with the major livestock markets concentrated around Maroua (between Banki and Guider, with the exception of Adoumri through to Garoua). Bogo and Molvouday play a particularly important role in the north Cameroon trade network, assembling and sending livestock on to Nigeria.[41]

3.3.3. Manufactured product channels

Manufactured product channels take a variety of routes, which change depending on policing activity and the preferences of the drivers ferrying between Nigeria and the other countries in the sub-region.

40 Although trade in skins is much less important economically, it is an age-old sector that was already feeding regional trade in pre-colonial times. This long-standing traffic is particularly well developed in Chad around two hubs, Sarh and Guelendeng, and is sent to Banki and Mubi (Nigeria). The collection of skins reaches into Sudan and the CAR.

41 Livestock exports to the plateaux of Adamaoua in Cameroon and the country's southern markets have long been restricted by a health barrier, set up also to prevent competition between the stockbreeders of Adamaoua and northern Cameroon.

Traffic from Nigeria to Cameroon and Chad is ferried by young people nicknamed "stuntmen" in Cameroon, who are used to the dangerous roads. They know exactly how to skirt around uniformed officers intent on regulating the traffic, not to mention taxing it. The massive influx of motorcycles in the mid-2000s changed the shape of traffic in manufactured products from Nigeria. Prior to this, the main form of transport was by bicycle, with cyclists able to carry up to two or three 50 kg sacks of sugar or 200 litres of petrol per trip. In Cameroon, for example, smuggled petrol, dubbed "*zoua*", sells for half the petrol station prices. Other trade movements are plied by small traders and "wheelers and dealers" in such items as televisions, radios, medicinal drugs, fabric, underwear, and beauty products.

In addition to this dispersed traffic are the more formal transport channels, trucking manufactured products across the region's highways. The main importers here are large traders established in the region's major cities (N'Djaména, Maroua, Garoua, Diffa, etc.).

3.3.4. Fish trade channels

Wharfs and fish markets operate around the main fishing areas of Lake Chad and the fisheries of the Benue and Logone rivers. Production has grown and marketing channels have expanded with the improved means of transport, the spread of a new preservation technique by the Igbo (*banda*, smoking) in the 1950s (Couty & Duran, 1968; Bouquet, 1990, Vol. 2: 294; Jolley *et al.*, 2001), and the adoption of a new fishing technique from Mali (*dumba*)[42] (Krings, 2004).

Around the lake, prior to the Boko Haram violence, the largest fish market was Baga Kawa in Nigeria, which collected the flows of fish before redistributing them to Nigeria's towns and cities. The other main markets are Doro Léléwa and Gadira in Niger; Darak and Blangoa in Cameroon; and Kinasserom, Fitiné, and Guitté in Chad. The flows of fish from Lake Chad are sent predominantly to Maiduguri and secondarily to N'Djaména (mainly fresh fish). Smoked fish goes to the towns and cities in the south of Nigeria, while dried fish is sold primarily in northern Cameroon and CAR.

In the lower Logone fishing zone, Maroua is the hub for the dried fish trade, collecting and redistributing to the nearby towns of Bogo, Mora, Mokolo, Mubi, Garoua, and Yagoua. Dried fish from the Logone River faces competition more to the south from smoked fish from the Benue and Mayo-Kebbi fisheries. These fisheries supply the border market of Badadji and secondarily Pitoa, Guider, and Garoua, which serve to distribute smoked fish through to the south of Cameroon (Yaoundé).

42 A *dumba* is a row of fishing traps strung across side by side. When well positioned across water channels, these traps can capture nearly all the resources in a given area, at the expense of fishers downstream.

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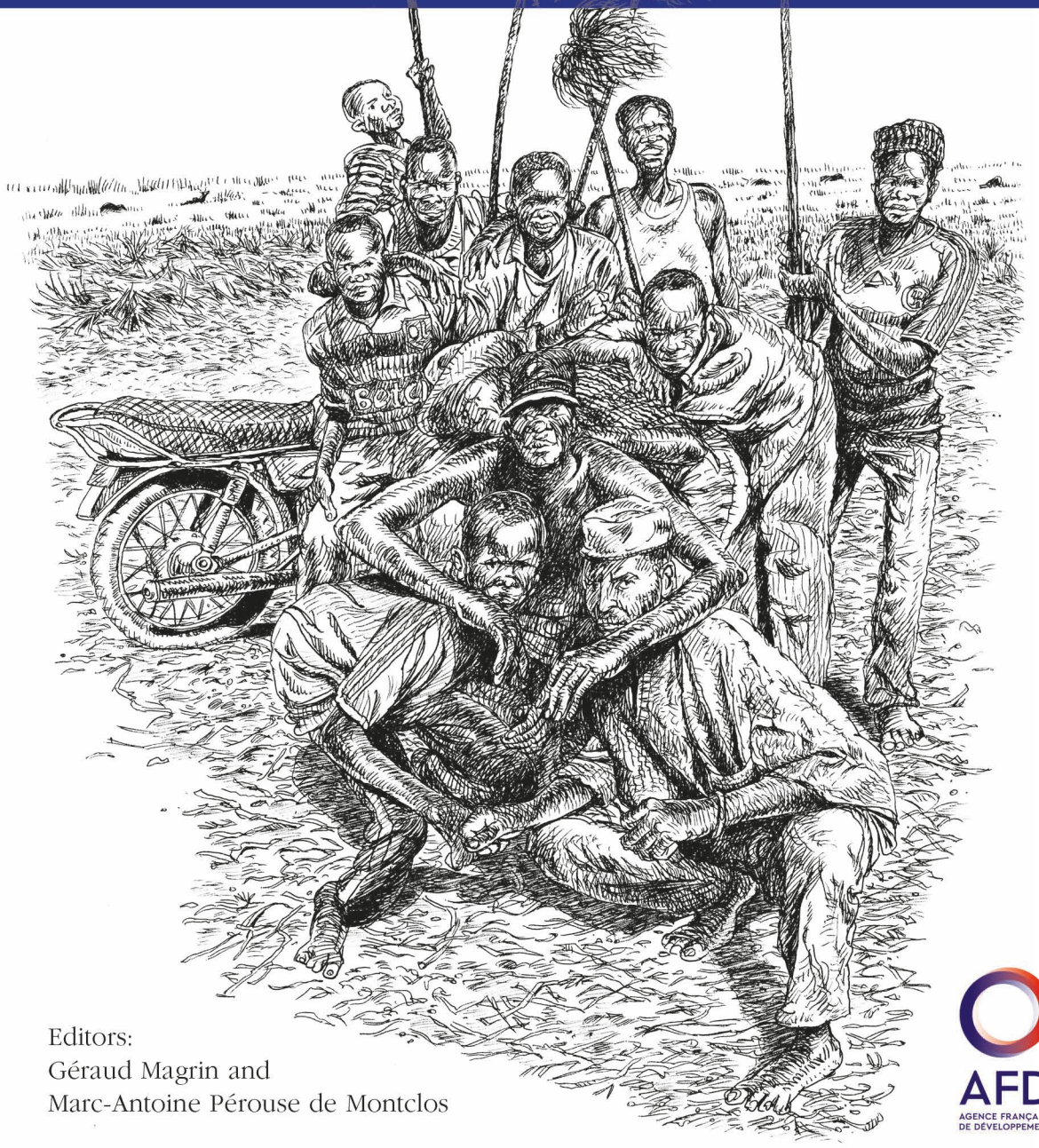

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Géraud Magrin and
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AGENCE FRANÇAISE DE DÉVELOPPEMENT

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Maps: Pauline Gluski

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Foreword

This report covers the benchmarking study on the Lake Chad region drawn up by the Research Institute for Development (IRD) under the terms of reference provided by the French Agency for Development (AFD). The main findings were obtained from workshops and field missions conducted from March to June 2017.

The introduction was written by Géraud Magrin and Marc-Antoine Pérouse de Montclos.

Chapter 1 was written by Emmanuel Chauvin, Charline Rangé, Jacques Lemoalle, Géraud Magrin, Christine Raimond, Sylvain Aoudou Doua, Hadiza Kiari Fougou, Abdourahmani Mahamadou, Ahmadu Abubakar Tafida, and Abdullahi Liman Tukur.

Chapter 2 was written by Marc-Antoine Pérouse de Montclos, Géraud Magrin, Emmanuel Chauvin, and Charline Rangé.

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Chapter 7 was written by Géraud Magrin, Marc-Antoine Pérouse de Montclos, and Jacques Lemoalle.

Appendix 1 was written by Marc-Antoine Pérouse de Montclos.

Appendix 2 was written by the entire team.

The study was reviewed by two IRD researchers, Christian Seignobos and Florence Sylvestre, to whom we are most grateful.