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Proposed Solutions to the Problems of the Lake Chad Fisheries: Resilience Lessons for Africa?

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Abstract: Fishing communities in Lake Chad are experiencing humanitarian crises—more than five million people in the region are hungry and malnourished—and fishers are in dire need of improved fisheries management policies. Understanding the fishers' resilience, and how they perceive their fisheries policies, could provide an opportunity for governments and fisheries managers to refine their policies. The present study, which is based on 38 semi-structured interviews carried out between January and April 2022 on the Nigerian shores of Lake Chad, breaks new ground, firstly by seeking to understand the issues raised by declining fish stocks in Lake Chad from the viewpoints of fishers themselves; and secondly by making use of resilience theory to interpret the fishers' responses to their situation. Our findings are that the fishers have a surer grasp of the most effective resilience strategies available to them than external bodies; and that the fishers' adaptive resilience and local knowledge provide a framework for developing smarter fisheries management policies for Lake Chad. This study provides evidence to support recommendations for Africa's supranational, national and local governments to invest in, and make use of, the fisheries research on the ground to address the problems facing its fisheries, rather than experimenting with seemingly random ideas from across the globe. The Lake Chad fisheries crisis is an extreme case demonstrating the harmful effects of external influences from which the fisheries of other African countries can learn lessons.

Keywords: sustainable fisheries management; resilience theory; expert and external management; indigent and internal management

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1. Introduction

Lake Chad was once the largest lake in West Africa, the fourth largest in Africa and the eleventh in the world [1]. However, according to some writers, between the 1960s and the 1990s it shrank by 90% and, in its current form, can no longer support the 30-plus million people who once depended on it for water and fish [2,3]. Fishing from this lake is an old but important source of livelihood [4–8]. The Lake Chad fisheries have experienced two major development phases: before the 1960s and after the 1960s [9]. Before the 1960s, fishing was mostly for subsistence purposes; fisherfolk fished with hooks, nets, traps, paddling canoes, and shallow water boats [9] and harvests were relatively low—between 10 and 20,000 tonnes of fish were landed yearly [9]. During this time, although relatively little was known about fish stocks in the lake [9], a 2018 United Nations report stated that Lake Chad was home to 135 species of fish. These species were distributed unevenly across the lake due to the distances between riverine systems and the various types of aquatic facie [10]. For example, the southern basin was fish rich with *Ichthyborus besse*, *Siluranodon auratus* and *Polypterus senegalu*, whereas in open water areas, Labeo coubie, Citharinops distichodoides and large Synodontis membranaceus were abundant; and indigenous species, including Oreochromis niloticus and Sarotherodon galilaeus were to be found in the archipelagic environments. Furthermore, due to higher salinity, the northern basin contained fewer fish species [10].

After the 1960s, there was a shift from a subsistence (local consumption) system to a wealth creation system, which is characterised by larger harvests gathered using more sophisticated fishing equipment. The African Knifefish (*Gymnarchus niloticus*), African Sharptooth (*Clarias*) and African bonytongue (*Heterotis niloticus*) were species commonly caught by fishers for transportation and sale at international markets [11,12]. With the development of this wealth-creation fishing system after the 1960s, Lake Chad experienced a rapid influx of migrant fishers from many different cultural and religious groups [13], and fishing became unregulated—over 95% of catches were juvenile fish "migrating between breeding grounds and the feeding areas" [9]. Neiland [9], cited Durand who noted that between 1963 and 1971, fish landings increased from about 20,000 tonnes to over 100,000 tonnes, and continued to increase reaching about 220,000 tonnes in 1974 [9]. However, this figure fell to the present level of 20,000 tonnes after 1974 [13]. Climate change triggered drought, and poor government management of water allocation [14] contributed to the shrinking of the lake, cutting fisheries opportunities by reducing fish stocks. As a result, only the fish species that adapted to the ecological conditions of the prevailing swampy environments were able to survive [15], hence the steady decline of fish landing which occurred [16].

The Lake Chad Basin Commission is an intergovernmental organisation that manages the use of natural resources in the basin, including water, biodiversity and fisheries [17]. Its remit is to promote cooperation among its member states, ensuring peace, security and sustainable and equitable development of the lake's resources, preventing the unilateral exploitation of those resources by any member state, and to resolve any disputes that emerge [18]. Its mandate includes the authority to issue regulations; to collect and disseminate information on member state projects; to recommend research programmes; and to monitor the progress of work in the basin [19].

The Commission was established in 1964 by Nigeria, Cameroon, Chad, and Niger. The Central African Republic joined in 1996, Libya in 2009 and observer status is held by four other countries—Egypt, the Democratic Republic of Congo, the Republic of Congo and Sudan. The Commission has three tiers of management, the highest organ of decision-making is the Summit of Heads of State and Government which meets every two years. The next level is the Council of Ministers, whose members are called Commissioners, of which each member state has two. The Council regulates the work of the Commission and meets once per year. Finally, the Executive Secretariat, led by the Executive Secretary, implements the decisions of the Summit and Council. The headquarters of the Secretariat is in N'Djamena, Republic of Chad. The commission is funded by the five main member states—Nigeria pays 52%; Cameroon, 26%; Chad, 11%; Niger, 7%; and the Central African Republic, 2%. The Commission also receives periodic payments from international aid bodies including the World Bank [19].

The Lake Chad Basin Commission claims it has been a success. Indeed, in 2008, it referred to its "outstanding achievements", saying "Within the limits of its mandate as spelt out by the statute, LCBC has achieved remarkable success in its operation since its creation in 1964. It has delivered dividends in agriculture (small scale) like promotion of good fishing practices, production of livestock, rural water supply, communication, transport, regional economic integration and cooperation as well as coordination of regional security" [19]. In particular, the Commission praised its 'Master Plan', which was adopted during its Summit in 1994 and the Strategic Action Plan (SAP) comprising 36 priority projects for safeguarding residents and their natural resources [19] which arose from it and was adopted in 2008. The Commission [20] also highlighted its Council's regional stabilisation strategy of 2018, saying "The strategy develops an overarching regional approach in dealing with the deep-rooted causes of under-development and the drivers of violent extremism and conflicts in the Lake Chad region. It is being implemented in eight targeted territories of the four member states" [20].

The Commission complimented the 2008–2015 Sustainable Development Programme of the Lake Chad Basin (PRODEBALT), saying "The implementation agency of the pro-

gramme is the LCBC through the Regional Coordination and five National Coordinations (Cameroon, Niger, Nigeria, CAR and Chad) supported by national and decentralised state services, NGOs, and specialised local agencies. The aim of the programme is to reduce poverty among the population, whose livelihoods depend on the resources of the Lake Chad Basin . . . and improve climate change adaptation capacity" [20].

Another initiative commended by the Commission is PRESIBALT, funded by the African Development Bank from 2016 to 2021, which, dovetailed with the Five-Year Investment Plan (2013–2017) of the Lake Chad Basin Commission, aimed to alleviate poverty and food insecurity for 15.3 million households, including women [21]. The Commission also applauded its own role in the USD 170 million Lake Chad Region Recovery and Development Project (PROLAC) announced in 2020 by the World Bank to support local capacity building; prevent conflict; reduce poverty; improve transport connectivity; and build community empowerment through citizen engagement [22]. The Commission is also self-congratulatory for its document, "Vision 2025", in which it explained the causes of the lake's environmental degradation and set out the challenges it faces in integrating the management of the basin's resources, which is necessary when dealing with those causes. The Commission claimed that it is making efforts to achieve its Vision 2025 goals [19].

Finally, the Commission is proud of its role in promoting the Transaqua project which aimed to refill the lake by means of a pipeline from the River Congo [23]. Although the Transaqua project has not been implemented [24], according to Sayan and Nagabhatla, [23] interest in it was revived during the 2010s, supported by high-profile figures such as Nigerian President Muhammadu Buhari and UN Secretary-General António Guterres, to prevent the lake from disappearing altogether. Transaqua was officially endorsed by the Lake Chad Basin Commission as the feasible option at the 2018 International Conference on Lake Chad. It was seen as more than a means of re-hydrating Lake Chad, but also as a strategy to deepen cooperation and partnership between neighbouring states [23]. Moreover, China has expressed its interest in joining the Transaqua project which it sees as an opportunity to extend its Belt and Road Initiative across the central African region. Italy also supports the project, hoping it will encourage residents to stay in the basin rather than seek refuge as migrants to its shores. Nigeria hopes it will increase its sphere of influence in the basin [23]. However, the Democratic Republic of Congo is opposed to the project because it believes it poses a risk to the country's security.

However, according to Magrin [25], despite all these initiatives, the Commission has not been successful. It is chronically short of funds; its staff are disproportionately senior directors with very few field workers; it has poor information flow across and between member states; and it has not been able to navigate the volatile politics of the basin states because it lacks institutional power and fisheries expertise. Sayan and Nagabhatla [23] describe the Commission as "ineffective (its members are among the world's most socially, economically and politically unstable countries)". Abu and Ahmed [18] assert that the Lake Chad Basin Commission has not achieved its objectives because its members lack political will (member states do not share a common objective); its finance is inadequate (member states do not always pay their annual dues); it has failed to stop member states from extracting water excessively for their own irrigation purposes ("Lack of water usage discipline and responsibility is key to the depletion of the water system of the Lake"; its organisational structure is weak (managers are often unqualified and information is not shared amongst staff); and cultural and language barriers divide it (Francophone versus Anglophone discourses).

At the present moment, despite the efforts of the Lake Chad Basin Commission, there is a 'humanitarian crisis' in Lake Chad. It can no longer sustain its dependents, which include over 5 million fishing households that depend on its fish for income, food and nutrients, about 2.4 million of whom are being pushed into destitution [26,27]. Without immediate and sustained intervention, the living condition of fishers and their households will continue to deteriorate and the number of poor, hungry, malnourished and destitute will rise [27]. The last fifty years of top-down initiatives by the Lake Chad Basin Commission have either

not materialised or have not produced sustainable solutions, for supporting Lake Chad fisheries and the households that depend on them. This study examines the views of fishery stakeholders, including fishers themselves, on local solutions for overcoming the considerable problems that exist in Lake Chad fisheries. In interpreting these views, we make use of resilience theory.

2. Theoretical Framework and Methods of Data Collection

Resilience theory divides strategies for dealing with adversity into three modes: passive; adaptive; and transformative [28]. Passive or inactive resilients are people who resignedly accept their disadvantaged circumstances as a given and carry on as before, ignoring the warning signs of an unsustainable future. They feel they are powerless to avert their destiny since fate determines life. To them, acceptance is more appropriate than futile resistance to inevitability [29]. Adaptive or reactive resilients are people who do not passively accept the adverse circumstances in which they find themselves but take positive steps to adapt to those circumstances. Like passive resilients, reactive resilients hold that it is futile to attempt to change external circumstances, but unlike passive resilients they see they can change themselves to adapt to these external circumstances. By changing their own behaviour they can improve their situation. Transformative or proactive resilients are people who aim to change external circumstances. Instead of adapting themselves to a life of perpetual vulnerability, transformative resilients seek to take charge of their own paths of development and thereby end their vulnerability. For transformers, the problems are in the world, not in the mind: there is a need to remake the world, not to remake the human being [30]. Transformative resilience is a political response, not, as in the adaptive mode, a psychological response. The solution to a problem is not to adapt to the system that is causing the problem but to replace that system and thereby end the problem.

Resilience theory is used in a range of sectors. For example, Linnenluecke [31] used it to investigate resilience in business and management studies, and Zimmerman [32] used it in social work as a conceptual framework for developing strength-based approaches that would help child and adolescent development. Breda [33] used it in development studies for designing social policies that could help the poor in South Africa. In fisheries, this three-part typology of resilience has been adopted by several writers. For example, Jentoft and Eide [34] say "we must learn how people within this sector are coping, adapting, transforming their situation". Armitage et al. [35] refer to "three dimensions of resilience ... absorptive capacity, adaptive capacity, and transformative capacity". Krogseng [36] describes resilience as "the ability ... to persist, adapt to change, and transform after ... a disturbance". Béné et al. [37] state "these three dimensions (absorptive capacity, adaptive capacity and transformative capacity) are seen as the three critical features of resilience". The present study uses resilience theory to analyse the resilience of fishers and other stakeholders in Lake Chad in order to arrive at management strategies that will enhance and build sustainable fisheries in Africa.

To meet this aim, the study made use of two forms of qualitative data. First, an extensive literature review was carried out to elicit views on the problems of the Lake Chad fisheries and potential solutions. Second, fieldwork was undertaken between January and April 2022 from the Nigerian shore of Lake Chad in which 38 interviews were carried out with dispersed fishers in Baga and Fatori communities in Borno state. Because of the lack of fishing records, key informant interviewees (KIs) were recruited through social networking i.e., by inviting interviewed stakeholders to recommend other interviewees. However, relying on social networking to recruit participants can be problematic as respondents are more likely to recommend people who hold similar views to themselves. So, to encourage heterogeneity and obtain a variety of perspectives, a wide range of respondents was sought. The 38 KIs comprised 20 small-scale fishers (SSFs), 4 community leaders, 2 fish sellers, 3 academics, 6 staff from the Lake Chad Basin Commission, and 3 staff from the Federal College of Freshwater Fisheries. Interview questions focused on fishers' perceptions about fishing management issues in Lake Chad before a ban on fishing was imposed, their coping

strategies, and their views about future management arrangements once the ban is lifted. These questions were generally semi-structured, allowing respondents the flexibility of reflection, thereby providing in-depth accounts of the current state and potential future shape of the Lake Chad fisheries and its management regimes. All KI interviews were transcribed and analysed using thematic content analysis [38]. Themes and frequencies of themes were counted and worked out in percentages.

3. Results of Fieldwork

This section reports KI interviewees' perceptions on three issues: (1) the main causes of the problems of Lake Chad fisheries; (2) the fishers' current coping strategies; and (3) the proposed future solutions for dealing with those problems.

3.1. The Three Main Causes of the Problem

According to respondents, there were three main causes of the decline in fish stocks in Lake Chad. The first cause was climate change. All 38 respondents said that climate change affected their fishing activities and by extension their quality of life. For example, KI-5 (a fisher) said: "almost all the fish that we use to catch have all migrated because of low rainfall . . . the lake is becoming narrow, and our regular Tilapia, Mud Fish and Moon Fish are getting smaller, what are going to do?" Like KI-5, another fisher (KI-16) linked their poor catch to climate change "I started fishing 44 years, then we had different types of fish in the lake but these days almost everything has disappeared . . . you cannot find Karwa [Tilapia] in our lake anymore, there is low rainfall, and the volume of water is low, fish only survive where there is plenty water, this is a big problem to us".

The second cause was Boko Haram where 68% of respondents said Boko Haram was responsible for the dire condition of the fisheries in Lake Chad. Many thousands of people fled the conflict zones and came to the Lake Chad area where they began to fish: "so many people that were affected by the Boko Haram conflict lost their sources of livelihood and without any experience, they started fishing with anything they have, so you see how Boko Haram caused problems in our fisheries" (KI-1) (a fisher).

The third cause was targeting small-sized fish. KI-5 (a fisher) said: "Already the fisheries is declining, we were catching small fish, and the newcomers caught small fish too". 76% of respondents linked overfishing in the Lake Chad to lack of effective fisheries management: "to have sustainable fisheries, there is need for control, but . . . in the LC, there was no organization that forcefully stop overfishing" (KI-20, another fisher??). KI-16 (another fisher) said: "I also blame fisheries management organization; they should have forced us to stop using small nets".

3.2. Current Coping Strategies (Passive and Adaptive Modes of Resilience)

On current coping strategies, fishers reported two resilience modes: passive and adaptive. About 45% of fishers were fatalistic (passive or inactive resilients), putting their faith in God to bring peace and thereby restore fishing to Lake Chad: "we are praying that Allah will bring peace in Nigeria, so the ban on fishing can be lifted and we will go about our normal business" (KI-10, a fisher). On diversification (adaptive or reactive resilience), 32% of fishers referred to a variety of adaptations they had made to insulate them from threats to fishing. For example, one fisher (KI-1) said: "I used to fish from the Lake Chad, but because they stopped us from fishing, I now buy, smoke and sell my smoked fish". Another fisher (KI-6) said: "because we are banned from fishing in the Lake Chad, I fish from rivers in Baga". A third fisher (KI-7) said he had switched to growing and selling vegetables. Many other fishers expressed an interest in diversifying into aquaculture. For example, KI-2 said: "I regret not saving money to learn aquaculture, immediately the government allow us to start fishing, I will save up to send my son to learn aquaculture—I now see that fishing alone is not reliable". However, several fishers said they would need substantial funds and training to be capable of fish farming.

3.3. Proposed Future Solutions (Transformative Mode of Resilience)

Two major (i.e., transformational) future strategies were proposed by respondents, conflict resolution and management restructuring. Nearly 60% of respondents said the government's ending of conflict was a necessary condition for a resumption of the Lake Chad fisheries: KI-38, chairman of a fishers' organisation said: "government has to sort out the Boko Haram conflict so we can start fishing again". In addition to the ending of conflict, 45% of respondents wanted much stricter control of their fishing methods to avoid overfishing. For example, KI-13 (a fisher) said: "As soon as the ban is lifted, government need to start controlling how fishers' fish, so that small fish will not be harvested until they mature". To control overfishing in Lake Chad, over 60% of respondents proposed the reform of the existing management structure by replacing the Lake Chad Development Commission with the Federal College of Freshwater Fisheries:

> "I prefer the Federal College of Freshwater Fisheries. I know them and they try to bring all of us [fishers] together. They advise us on how to catch fish so that our income will increase. I don't know much about the Lake Chad Basin Commission; I only know that they are the first organization in the Lake Chad and that they are a government big organization. But we don't see them." (KI-6, a fisher)

Another fisher, (KI-7) said the Lake Chad Basin Commission used to be effective but is no longer:

> "The Lake Chad Basin Commission is no longer serving us. I can remember that the staff from the Lake Chad Basin Commission used to check on us, they advised us. Their staff knew us by our names, they will call me by my name and ask me whether there is any problem with my fishing tools. They also knew our children by name, [but] everything has changed. they are now bigger than they were in those days. I want to believe that they have other responsibilities [and] this may be why they no longer come to check on us."

Most fishers wanted the Federal College of Freshwater Fisheries to be given the responsibility of managing Lake Chad fisheries. KI-33, a researcher at the Federal College of Freshwater Fisheries said the College was closer to the fishers and their problems than was the top-down Lake Chad Basin Commission:

> "We are a college and research institute, and our work is to research, teach and advise the government especially on issues relating to aquaculture. But I do not know whether the government makes use of our research . . . In . . . Africa, we import everything including knowledge . . . I call this type of management Top Management, because you can see very well that this management style is not connecting with the people [and] I can count several projects where these ideas failed . . . the Lake Chad Basin Commission has no vision for fisheries . . . this organization focuses more on managing its large staff than fisheries...The number one problem is the imported knowledge . . . We need to learn to challenge these ideas, we must query expert knowledge, invest in research, fieldwork, regulating fisheries, stock taking and monitoring of fishers."

4. Discussion

The main question arising from the results section that stands out for discussion is what resilience strategies—passive; adaptive; or transformative—are likely to succeed? Beginning with transformative strategies, it appears that top-down projects for transformation are less likely to succeed than bottom-up projects for transformation. For example, Transaqua, which is a top-down transformative proposal has been criticised for giving the illusion that it is a universal panacea, solving all the problems of Lake Chad in one gigantic leap—restoring fisheries, providing hydroelectricity, and facilitating irrigation [25]. However, water from the river Congo which was meant to be used for refilling Lake Chad is not future-proof against climate change. Yet successive leaders of the Lake Chad Basin

Commission have made the Transaqua project its flagship policy. Moreover, as Sayan and Nagabhatla [39] point out, the Transqua project is not an endogenous initiative, but a vision promoted by foreign countries and presented as a Pan-Africanist ideal to gain African countries' approval.

There are several similar grandiose top-down failed fisheries projects across Africa [23]. For example, pushing foreign expert knowledge against local knowledge is stalling the development of Africa's inland aquaculture, thereby exacerbating hunger, malnutrition, and poverty in many fishery-dependent communities across the continent [30]. Most African communities prefer growing Catfish, but external experts have continued to advise replacing the growing of Catfish with Tilapia, a species that is not popular in communities [40,41] Another example is in Sierra Leone where the Joint Fisheries Monitoring Centre, designed to track illegal fishing, closed down after two years due to a lack of funds, shortage of electricity, storm damage and unreliable internet connections [42]. The costs of such failed grand projects in Africa is high. One estimation is that Africa loses between USD 2 and 5 billion due to ill-fated top-down projects and policies [43].

The most important bottom-up transformational proposal is the reform of the management structure of Lake Chad by replacing the Lake Chad Basin Commission with the Federal College of Freshwater Fisheries. Fishers expressed a strong preference for a completely new system of fisheries governance headed by the Federal College. Interestingly, they embraced the Federal College of Freshwater Fisheries not because it offered them lenient management with few restrictions, but because it promised a tough regime of regulations to protect the stocks. These fishers said the fisheries needed a new regime of strong management to curb unsustainable practices such as small-size fishing nets (see Section 3.3 and Table 1). Moreover, fishers preferred the Federal College because its staff cared about them and because through knowledge gained from its own research, it advised fishers to take up aquaculture and educated them on safe fish farming. This highlights the need for African governments to support research on the ground and work with local research findings rather than experimenting with imported ideas. Currently, Africa contributes less than 3% of the world's research output and produces 0.1 percent of all patents [44]. However, it is unlikely that the governments of the member states of the Lake Chad Basin Commission would any time soon agree to its replacement by the Federal College of Freshwater Fisheries. So, although this bottom-up transformational initiative is more feasible than the top-down transformational Transaqua project, it remains a distant prospect.

Table 1. Percentage of KI's perceptions about themes (Source: data collected by authors from the Nigerian shore of Lake Chad).

Recurring Themes from Key Informant Interviews (KIs') Perceptions	Percentage of KI Respondents
Main causes of the problem	
Climate change	100
Boko Haram conflict caused loss of jobs, migration into fishing communities and subsequent overfishing	68
Lack of effective fisheries management	76
Current coping strategies (passive and adaptive modes of resilience)	
Fatalism	45
Diversification	32
Proposed future solutions (transformative mode of resilience)	
The end of the insurgency	58
Strict control to prevent overfishing	45
Reform of the management structure	66

Turning to adaptive or reactive resilient strategies, there were promising signs of effective action. In response to climate change, 'overuse' of water from the Lake, and overfishing, 32% of fishers reported seeking supplementary or alternative livelihoods (such as fish farming and growing vegetables) as a means of alleviating poverty, hunger, malnutrition and increasing destitution (see Table 1). These adaptive resilients were developing structures that could encourage more fishers, including inactive resilients (fatalists) to follow suit, which would reduce pressure on Lake Chad's declining fisheries, thus helping to rebuild the lake's fish stocks.

Of the three resilience strategies, adaptive resilience strategies are most likely to succeed because, unlike passive resilience strategies, they entail positive action by fishers to address the problems facing them, and unlike transformative resilience strategies, they are realistic in scale and largely within the fishers' own hands to implement [14,25]. The diversifying of livelihoods is increasingly becoming a response to alleviate the impact of climate change on fisheries [45–48] and this could provide a foundation for developing climate-smart fisheries policies for Lake Chad.

5. Conclusions

The conclusion of the paper is twofold. First, fishers in Lake Chad exhibit all three modes of resilience in dealing with the adverse circumstances they have faced. Some fishers have survived by adopting the passive mode of inaction—putting themselves in the hands of God to deliver them from hardship. This is a powerful cognitive response that enables them to cope mentally with severe deprivation. Other fishers have survived by adopting the adaptive mode of reaction—adjusting their behaviour to take advantage of strategies such as diversification (e.g., switching to aquaculture). Yet other fishers have responded by adopting the transformative mode of pro-action—seeking to remove the threats by changing the system of governance which spawns them—though, given the limited prospects of such change, it is more of a cognitive response. Secondly, these different strategies not only reveal the core resilience of fishers to deal with strained circumstances in diverse ways, but also provides management with evidence of how to develop sustainable management strategies. Governmental authorities should recognise the value of these fisher responses rather than experimenting with ideas that may have worked elsewhere. Doing this entails listening to fishers and supporting them with locally derived research. Specifically, the role of governmental authorities should not be to impose their own resilient strategies on fishers, but to work with the realities on the ground, providing encouragement and practical help to the various resilient strategies that fishers have devised for themselves, and thereby translating resilience strategies into corresponding sustainable fisheries management policies. The diversifying of livelihoods is increasingly becoming a response to alleviate the impact of climate change on fisheries—this could provide a foundation for the development of climate-smart fisheries policies for Lake Chad.

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