

Research Article

Researcher Commitment, Implementation of Research Findings in Environmental Sciences in the Lake Chad Basin: The Role of Psychological Dispositions

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Abstract

Problems of environmental degradation are a reality that contributes considerably to the turmoil of the Lake Chad Basin (LCB) populations. However, these populations do not take to the solutions put forth to solve the problems posed by the scarcity or degradation of water, air, soil and vegetation. This research aims at exposing the psychological factors that hinder research engagement in Environmental Sciences. Likewise, it examines those factors that inhibit the willingness of research instigators and facilitators to invest in this field, and the psychological factors underlying the non-implementation of research findings. Thus, this study aims at exploring *how cognitive-affective factors of actors involved in environmental issues inhibit the researchers' engagement in Environmental Sciences and the implementation of their findings in the LCB*. The population of study is that of Cameroon, Chad and Niger. Using the technique of reasoned action, data has been collected from independent and institutional researchers, institutional managers, stakeholders in charge of implementing research programmes and infrastructure in Environmental Sciences, beneficiaries, and students. It stems from the content analysis carried out that on the one hand, the psycho-affective dispositions of the beneficiaries and programme initiators inhibit the mental dispositions of the researchers, and on the other hand induces other psychological mechanisms of down looking Environmental Sciences with regard to other scientific fields.

Keywords

Environmental Sciences, Psycho-affective, Lake Chad Basin

1. Introduction

The notion of commitment as well as that of implementation implies a cognitive, affective and conative investment of the targeted population. In general, the importance given to the study depends on the people history. As every group of people is unique in its customs, mentalities and ways of life,

its attitude towards the challenges and opportunities differ [5, 16]. The focus of research and its corollaries is often done in relation to the need of the actors involved in the process of the implementation of findings.

In Africa, issues on research are very often coupled to

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problems in the areas of finance, infrastructure, human resource, research management policy, etc [17, 6, 9]. Research on environmental issues is one of the areas most affected by these adversities. In Cameroon for instance, of all the state universities, only one has a Department of Environmental Sciences, which equally trains Chadians. In addition to the difficulties common to other fields of research, Environmental Sciences face serious hurdles with the chain of stakeholders interacting with the researcher. Meanwhile, the problems linked to environmental degradation considerably contributes to the turmoil of the populations in the Lake Chad Basin (LCB). The population does not readily accept the solutions proposed to the problems of the scarcity and degradation of water, air, soil and vegetation [15, 4, 1, 11, 10]. Owing to these contradictions, this study intends to elucidate on how the cognitive-affective factors affecting the network of actors involved in environmental issues inhibit the engagement of researchers in Environmental Sciences and the implementation of their findings in the LCB.

This research aims at highlighting at the psychological level, the factors that obstruct engagement in research. It equally examines the role of initiators or supposed research facilitators in hindering this engagement, as well as the psychological factors underlying the non-implementation of research findings. In order to attend to the above-mentioned issues, this study sets out to present the area of study and its related problems and review relevant research in Environmental Sciences in the LCB countries. This will be followed by a detailed presentation of the research methodology, the collected data and its interpretation. Finally, there will be a psychological analysis of the strategic behaviour of the social network involved in research activities, as well as the implementation of the findings following the social network theory.

2. Presentation of the Site and Related Problems

The Lake Chad Basin consists of the following countries¹: Cameroon, Chad, Niger, Nigeria and the Central African Republic. The zone chosen for this study is the set of French-speaking countries of the LCB in which the lake makes its bed. These are Cameroon, Chad and Niger. Nigeria has been excluded because it is more involved in Environmental Science research than these other countries.

In 1960, the surface area of the lake was 25,000m². Its shrinkage began in the early 1970s and today, it is 8,000m²². Forty-five million (45, 000,000) people live in the LCB. More than half of this population lives from agriculture, livestock and fishing. Population intensification, construction of dams, increased irrigation and climate change are reducing the water level. The main environmental problem in the Lake Basin is

drought, which causes the drying up of Lake Chad³. This leads to scarcity of vegetation and destruction of soil due to anthropogenic activities and exposure to all forms of weather. This scarcity of water also breaks the food chain. Some plant and animal species are disappearing due to overexploitation of existing resources or to an ecosystem that is unfavourable to their survival. In addition, there is a strong trend towards plastic waste pollution in this area. The following table presents an example of the rate of plastic waste in the city of Moundou in Chad [8, 1, 3].

Table 1. Household waste in the city of Moundou.

Waste composition	%
Metals	10,3
Plastics	42,1
Other	47,6
Total	100

Source: Fieldwork by Model Djemon and Sabine Djimouko, February 2020

In addition to the food crisis that is becoming a feature of this area, there are inter-community conflicts between herders and farmers because of scarcity of water. Many other socio-economic and political problems arise from this water scarcity. Added to many other problems, it is difficult for men living in areas where water is direly scarce, to find a wife. The presence of Boko Haram in the area further degrades this environment with the exaggerated cutting of firewood, fire incidences, the destruction of some water points among others [15].

3. Inventory on Researches in Environmental Sciences in the Selected Countries of LCB

3.1. Cameroon

The Department of Environmental Sciences of the University of Maroua is the only scientific space where basic research related to Environmental Sciences is carried out. This Department is hosted at the Advanced School of Engineering and trains engineers in Environmental Sciences. However, it is also possible to go in for a Master's degree at the Advanced School of Engineering, which offers Doctoral Training Units leading to enrolment in doctoral studies. Only one thesis was defended in this doctoral school in 2020.

¹ Map attached N°2: Map of countries in the Lake Chad Basin

² Map attached N°3: Evolution of the Lake Chad Basin between 1963 and 2007

³ Map attached N°4: Drought-affected soil in the Lake Chad Basin

In the Faculty of Sciences of the University of Douala, there is a professional Bachelor's cycle option in Laboratory Technology that trains in Environment and Phytosanitary.

The Faculty of Agronomy and Agricultural Sciences (FASA) of the University of Dschang trains agricultural engineers in food processing. It has an option in Environmental Management where doctoral research is carried out.

The National School of Agro-Industrial Sciences (ENSAI) in Ngaound é é trains students up to Master's level. In addition to agricultural production, they do environmental engineering, analytical techniques in Environmental Sciences, industrial chemistry and environment.

The Regional Centre for Specialised Education in Agriculture (CRESA) is specialised in Environmental Impact Studies, with a course in Environment and Conservation Measures, which ends at the Master's degree level.

The Higher Institute of Environmental Sciences (ISSE) specialises in agroforestry, climate change, environmental health and environmental impact studies. Studies here go up to the Master cycle.

There are also a few private Institutes with an environmental focus, but they deal with purely didactic issues, usually on food safety and plant protection. NGOs such as the Deutsche "Gesellschaft für Internationale Zusammenarbeit (GIZ)" take students on internship as part of their Master's degree research.

3.2. Niger

The Abdou Moumouni University, with its Faculty of Science and Technology, has a sub-regional research centre, the West African Science Service Centre on Climate Change and Adapted Land Use (WASCAL-Niger), which provides training on climate change and the environment. The training cycle goes up to the Master's level.

The Faculty of Humanities and Social Sciences (FLSH) provides training from Master's to Doctorate levels on the issues of the environment in the Department of Geography.

The University of Diffa specialises solely in environmental issues. It has several Departments and trains from Bachelor to Master levels.

There also exist independent research centres, such as Centre Climatique Régional pour l'Afrique de l'ouest et le Sahel (AGRIMET), Institut International de Recherche sur les Cultures des Zones tropicales Semi-arides (ICRISAT) and West African Science service Centre on Climate Change and adapted Land Use (WASCAL).

NGOs also fund Environmental Sciences research. The World Food Programme (WFP) for instance provides funding to some Lecturers of the Faculty of Agronomy who recruit Masters and even doctor of philosophy (PhD) students to work on land reclamation.

3.3. Chad

Among the three countries selected for the study, Chad is the least interested in Environmental Sciences training or research than the other countries. However, as in the other LCB countries, this training takes place both at Universities and Institutes.

The University Institute of Agricultural and Environmental Sciences (IUSAES) in Sarh trains students up to Bachelor level.

At the Adam Barka University in Ab é é there is an option in Environmental Sciences in the Department of Geography. However, this option is chosen at the third year of the Bachelor cycle and the training ends in the same year.

NGOs in this zone are not really involved in supporting Environmental Sciences research as done elsewhere, like the cases in Niger.

From the preceding overview of Environmental Sciences research in the three countries, it stems that state institutions are the only ones providing high-level training, and a possibility of conducting postgraduate research. However, the number of training structures is limited. Private Institutes are not interested in research and NGOs contribute only in a subsidiary way. This leads to the conclusion that research in Environmental Sciences is relegated to the background.

4. Research Methodology

In order to find out how cognitive-affective factors influence the actors involved in environmental issues, and inhibit the commitment of environmental researchers as well as the implementation of their findings in the same way as those of other scientific fields in the LCB, four hypotheses have been put forth.

The data collection technique is based on the researchers field experiences, literature review and interviews with independent researchers and institutional researchers, managers of institutions, managers in charge of the implementation of research programmes and infrastructures in the field of Environmental Sciences, students and beneficiaries (civil society). The study population is that of Cameroon, Chad and Niger, involved in Environmental Science research. The selection of participants for the study is based on reasoned action.

The data collected are based on a 16-item interview guide that covers: the perception and affective dispositions regarding the use of resources, the psychological dispositions of the heads of institutions, initiators, and curriculum designers towards funding and other forms of support for the development of Environmental Sciences, and the psycho-affective dispositions of researchers towards their study. The data collected is subject to content analysis.

Table 2. Distribution of respondents by type and country.

Types of respondents	Number of respondents per Country			Total
	Cameroon	Chad	Niger	
Programmes Instigators	5	3	4	12
Independents and institutional researchers	15	10	15	40
Head of institutions	5	2	3	10
Students	10	10	10	30
Beneficiaries (civil society)	20	20	15	55
Total	55	45	47	147

5. Data Presentation and Interpretation

The data collected for this study are presented around the above-formulated hypotheses. They are as follows.

5.1. Investment in Environmental Research Is Considered as a Waste of Resources

The countries of the LCB are noted as poor. Strategic choices in investment are thus generally oriented towards what is profitable or useful to the populations on a short term. Investment in this area is focused on training than on research because investing in environmental research does not bring immediate profits.

Moreover, there is a lack of interest on the part of young people choosing Environmental Science courses. At the University of Maroua, for example, the Environmental Education option was closed in 2020. In addition, the specialities no longer start at the second level of University studies but rather at the third level because the engineers trained have difficulties entering the job market.

The competences of those in charge of Academic Affairs and Research sometimes does not allow them to give importance to the need of investing in the field of Environmental Sciences. In Chad, for instance, the tendency to appoint individuals with a military background is a common practice. The appointed personalities do not generally give considerable value to Higher Education studies in general.

5.2. Lack of Confidence of Research Programme Organizers and Their Inability to Sustain Researchers in Convincing Results

The lack of confidence strongly correlates with the view that investment in research is a waste of resources. The awareness that investment in Environmental Sciences research does not bring tangible results, leads to the lack of

confidence on the part of the Ministries in charge of training or of defining the right conditions for research. This state of affairs enhances the lack of confidence on the part of the population and the scientific community.

Furthermore, the human resource that could provide quality expertise to learners in this field is reduced in terms of quality and quantity. Hence, the lack of funding, infrastructure and human resources to carry out quality work leads to lack of confidence in the chain of people in the social network involved in research.

5.3. Non-empowerment of Researchers Whose Findings Are Based on Local or Hybridized Approaches

Several factors explain researchers' lack of confidence in this context. Some of these are related to the researcher and some others depend on the initiators and beneficiaries. With regard to the researcher, the following factors can be mentioned:

- 1) The researchers' consideration of findings based on local materials: This implies the researchers' satisfaction when the latter presents a local solution to research work on the one hand, and on the other hand, the consideration that other researchers in the former environment give to this type of research. However, this assurance is based on the fact that research would have a positive impact on the researcher's career in terms of advancement or promotion.
- 2) The ability of the researcher to develop professional skills in his domain in such a way that concrete achievements can be made on the one hand, and develop potentials on the other hand. This also implies the importance of the researcher's capacity for self-evaluation.
- 3) The relevance for the researcher to engage in projects on certain aspects of environmental protection (e.g. drought or water scarcity). The researcher is less assured when there is lack of understanding of the environmental impact and the significance of the project on

the local population. This may correlate with a negative perception of their own performance in delivering local or hybrid programmes or products.

The researcher's trust in his findings and local solutions also depends on his active participation in decision-making, both in terms of the content of the research carried out and the decisions of the research institution. This trust also depends on the value attributed to research approaches and findings.

The researcher's affective dispositions towards needy populations or innovation on the one hand and his ethics and commitment on the other.

For factors independent of the researcher, the following can be listed:

The social and physical research work environment: This concerns the interpersonal relationship between researchers in the field. The problem is the absence of collaboration between researchers in terms of individual commitment of researchers belonging to a common team on the one hand, and the quality of the relationship maintained with the supervisors on the other.

For the physical factor, the geographical location in which the actor had evolved plays an important role in his actual perception of the problem. Some actors who had lived in forest zones would not understand an area such as the Sahel. They will be unable to project themselves and feel the degree of suffering involved in living in ecologically degraded areas like those affected by drought.

The lack of trust could also correlate with the importance that the Institution attaches to research in the field. The share of the Institution's portfolio allocated to Environmental Sciences research on the one hand, and on the other hand, the place allotted to Environmental Sciences innovation, equipment, support or supervision of field trips influence the researcher's commitment and affects his confidence.

5.4. The Difference Between Beneficiaries' Values and Available Solutions

During the work carried out with Non-governmental Organisations (NGOs) such as GIZ, African Positive Peace initiative in Cameroon (APPIC), etc., it was noted that the beneficiaries did not make use of the devices made available to them free of charge. These devices aimed at cleaning up the environment and remedying the shortcomings caused by its degradation. Several factors explained their attitudes such as problems of communication, negligence, laziness and especially inadequacy between the value of the beneficiaries and the solutions provided, and the complexity of the tools and programmes proposed. For these last points, the factors blamed are:

- 1) The absence of cultural or environmental values and what is being proposed to the beneficiaries: The solutions in terms of programmes or materials put at the disposal of the beneficiaries are often designed according to the realities of overseas countries. This poses a problem in terms of recognising or using pre-existing behavioural

patterns for the use or understanding of the objects or programmes made available. The programmes sometimes involve actions that do not correspond to the beneficiaries' lifestyle, habits or values. This is the case with the consumption of certain reptiles, which can sometimes better connect the populations to their transcendence, and which can only be hunted by setting bush fires. As for reforestation programmes, in addition to banning these fires, they sometimes reforest the site on which these reptiles should normally be hunted. Consequently, solutions for acting in favour of the environment should take into account the usual habits or practices of the beneficiary populations.

- 2) Conservative attitude of the beneficiary: The peoples of the Lake Chad Basin are quite conservative because of their religious practices and their mental dispositions, which are part of a collective unconscious, that ensure the transmission of values to generations. These mental dispositions make it difficult for the local population to accept what is unfamiliar to them. The uncertainty inherent in a novel object, instead of arousing their curiosity or awakening some other positive feeling, triggers a feeling of mistrust and rejection.
- 3) The choice of locations for investment: It is observed that NGOs and other donors carrying out environmental activities in the community do not involve the community in the implementation process of these projects. Investments are often made in places that are sacred to the people or on land that reminds them of sad historical events. Thus, the value attributed to these places becomes an obstacle to accessing the investment. An example is the construction of water points made for irrigating the soil on a site soiled by the blood of local residents during the exactions of Boko-Haram, in villages such as Maxi in Mayo-Tsanaga, in Cameroon. Another example is that of street lamps installed for their night lighting to prevent the destruction of woody species by the population on sites of conflict between two villages. These street lights remain unused and are sometimes vandalized by local residents.

6. Strategic Behaviour of People Involved in the Research in Relation to Social Network Theory

The social network theory allows us to read the phenomenon studied in more than one way. Firstly, for an understanding of the behaviour of the initiators of programmes, and secondly, for the implementers of the research findings.

According to social network theory, the orientation of individuals' economic choice is dependent on their social ties and influences. Individuals define and orientate their economic actions in relation to their preferences and their choice of a group (choices that could stem from their history). Thus,

economic choices are constrained by social networks and decisions made by a group of individuals. This influence of the group on the economic choices of the actor stems from the strength of the ties that bind the actor to the group. According to Granovetter and supported by [12, 7], the strength of the group link results from quality of time, emotional intensity, intimacy and reciprocal services, which characterize this bond. Strong ties are established with people in the restricted social sphere (families, friends, colleagues) and weak ties with acquaintances.

Following this analysis, one could understand that the attitude of the population of the LCB towards programmes, products, advice or other solutions made available to them for the management of the inconveniences caused by environmental degradation, or for its protection, strongly depend on the behavioural patterns constructed over time throughout the primary socialization of the actors [14].

Concerning "Investment in environmental research which is considered as a waste of resources", Institutions primarily responsible for research in Environmental Sciences like the Ministry of Higher Education and the Ministry of Research and Innovation, would not want to spend money that would not be profitable. Furthermore, ideally, they would want to design a product that meets the needs of the users, which can to match the mental dispositions and cultural considerations of the recipients to some extent. They would do this either by fitting into the realities of its context, or by minimizing the costs of manufacture, so as not to pre-empt sustaining heavy financial losses. This is not easy to achieve, given the realities. They therefore wait to make the right strategic choices or to choose the best opportunities. Kirzner alludes to this attitude of the entrepreneur as *alertness* [2, 16, 13]. Thus, the ideal solution in our context is the first approach.

7. Conclusion

This study aimed at establishing the reasons for inequity in the sciences, particularly between other sciences and Environmental Sciences. The question that guides the study states thus: 'how do cognitive-affective factors in the chain of stakeholders involved in environmental issues inhibit the engagement of environmental scientists and the implementation of their findings in the LCB?' The exploration of this question brings to light three categories of stakeholders: the initiators of school programmes, the researchers and the implementers of research findings, considered as a chain wherein the actions or attitudes of some affect the behaviour of others. This organization gives a subservient position to Environmental Sciences. The study is carried out in the Lake Chad Basin, which presents significant environmental problems today, due to the drying up of Lake Chad. The selected countries for this work are Cameroon, Niger and Chad.

This study demonstrates that the cognitive and affective dispositions of school programmes initiators, who are also the financiers, are not favourable toward a substantial investment in Environmental Sciences because this field does not have

usable or profitable immediate results, likely to allow students to take charge of themselves directly after their studies. The beneficiaries, on the other hand, often do not welcome the solutions provided to them and as such do not adhere to the programmes proposed to solve environmental problems. This is because of the mismatch between their cultural values and afore-mentioned solutions. This is sometimes because of their cognitive incapacities, which lead to conative blocks that hinder the use of the solutions. Even students, who are part of the beneficiaries, are afraid of not being able to find a job after their studies in Environmental Sciences. The attitude of both the initiators and the users thus influence the interest of the researchers. Their mental and emotional attitudes towards the subject of their own sciences are often not positive, because on the one hand the initiators neglect their field and on the other hand the researchers' efforts are not valued by the users.

It is possible to address these often-negative dispositions of the social network involved in Environmental Sciences research. Based on the Social Network theory, the appropriate solution to deconstruct the negative attitude of initiators entails taking into account the mental dispositions and cultural values or even the cognitive abilities of the latter when designing solutions that aim at protecting the environment. Psychoeducation could equally help the initiators and researchers and thus rescue Environmental Sciences from its current subsidiary position.

Abbreviations

LCB	Lake Chad Basin
FASA	The Faculty of Agronomy and Agricultural Sciences
ENSAI	The National School of Agro-Industrial Sciences
CRESA	The Regional Centre for Specialised Education in Agriculture
ISSE	The Higher Institute of Environmental Sciences
GIZ	Gesellschaft für Internationale Zusammenarbeit
FLSH	The Faculty of Humanities and Social Sciences
WFP	World Food Programme
AGRIMET	Centre Climatique Régional pour l'Afrique de l'ouest et le Sahel
ICRISAT	Institut International de Recherche sur les Cultures des Zones tropicales S éni-arides
WASCAL	West African Science service Centre on Climate Change and adapted Land Use
IUSAES	The University Institute of Agricultural and Environmental Sciences
APPIC	African Positive Peace Initiative in Cameroon
NGOs	Non-governmental Organisation

Author Contributions

Mbiah Anny Flore Tchouta: Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Supervision, Validation, Writing – original draft

Ovambe Mbarga Guy-Bertrand: Data curation, Formal Analysis, Investigation, Methodology, Writing – original draft

Balna Jules: Data curation, Investigation, Writing – original draft

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Conflicts of Interest

The authors of this paper declare that they had no conflict of interest that could affect the theoretical and methodological framework or the results produced during this research.

Appendix

Table 3. Distribution of responses on the perception of the degree of implementation of the solutions proposed to the populations to clean up the environment on a scale of 1 to 5.

Cameroon		Chad		Niger	
Respondents Types	Numbers	Respondents Types	Numbers	Respondents Types	Numbers
Programmes Initiators	1	Programmes Initiators	1	Programmes Initiators	1
Independent and institutional researchers	2	Independent and institutional researchers	1	Independent and institutional researchers	2
Head of institutions	1.5	Head of institutions	1	Head of institutions	2
Students	1	Students	1	Students	1.5
Beneficiaries (civil society)	1	Beneficiaries (civil society)	1	Beneficiaries (civil society)	1.5

Table 4. Distribution of responses by order of perceived effectiveness of resource allocation by field of study.

	Cameroon		Chad		Niger	
	Respondents Types	Numbers	Respondents Types	Numbers	Respondents Types	Numbers
programmes initiators	Arts & Letters	6 th	Arts & Letters	5 th	Arts & Letters	5 th
	Biological Sciences	2 nd	Biological Sciences	2 nd	Biological Sciences	4 th
	Environmental Sciences	5 th	Environmental Sciences	6 th	Environmental Sciences	3 rd
	Technological Sciences	1 st	Technological Sciences	1 st	Technological Sciences	1 st
	Physical Sciences	3 rd	Physical Sciences	4 th	Physical Sciences	2 nd
	Social Sciences	4 th	Social Sciences	3 rd	Social Sciences	6 th
independent and institu- tional re- searchers	Arts & Letters	3 rd	Arts & Letters	5 th	Arts & Letters	6 th
	Biological Sciences	2 nd	Biological Sciences	2 nd	Biological Sciences	4 th
	Environmental Sciences	5 th	Environmental Sciences	6 th	Environmental Sciences	3 rd
	Technological Sciences	1 st	Technological Sciences	1 st	Technological Sciences	1 st
	Physical Sciences	4 th	Physical Sciences	3 rd	Physical Sciences	2 nd

	Cameroon		Chad		Niger	
	Respondents Types	Numbers	Respondents Types	Numbers	Respondents Types	Numbers
Head of institutions	Social Sciences	3 rd	Social Sciences	4 th	Social Sciences	5 th
	Arts & Letters	6 th	Arts & Letters	4 th	Arts & Letters	6 th
	Biological Sciences	3 rd	Biological Sciences	2 nd	Biological Sciences	3 rd
	Environmental Sciences	4 th	Environmental Sciences	6 th	Environmental Sciences	4 th
	Technological Sciences	1 st	Technological Sciences	1 st	Technological Sciences	1 st
	Physical Sciences	2 nd	Physical Sciences	3 rd	Physical Sciences	2 nd
	Social Sciences	5 th	Social Sciences	5 th	Social Sciences	5 th



Figure 1. Map of countries of the Lake Chad Basin.

<https://th.bing.com/th/id/OIP.7vVV3Yp9ZpfYbRNfXiDnfwHaHI?pid=ImgDet&rs=1>



<https://www.dinosoria.com/climatique/lac.jpg>

Figure 3. Drought-affected soil in the Lake Chad Basin.

La 3^e réserve d'eau douce au monde a perdu 90% de sa superficie et pourrait disparaître d'ici 20 ans

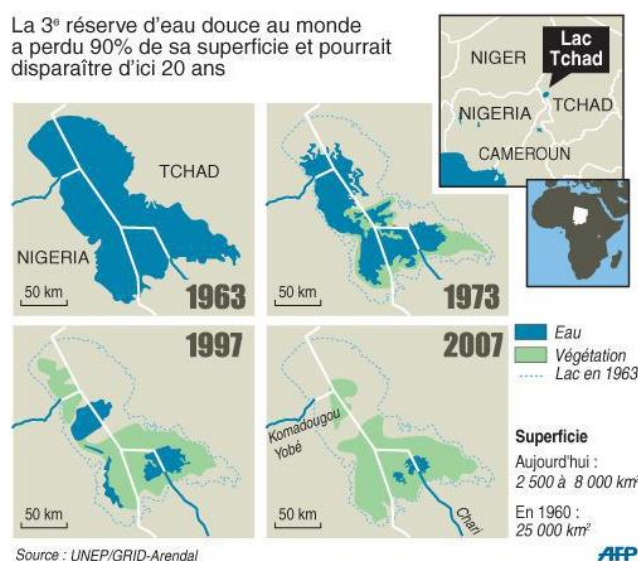


Figure 2. Evolution of the Lake Chad Basin between 1963 and 2007.

<https://www.francetvinfo.fr/pictures/zO1pmCzMp2lAnDlMwt1gmSGSTo/fit-in/720x/2018/11/27/Carte-lac-Tchad.jpg>

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