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Land use Land Cover Assessment of Lake Chad, Africa

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Abstract: *Lake Chad is a vitally crucial wetland in the semi- arid Sahel region of Africa provides the basis of many millions of livelihoods which defends on its water and seasonal fluctuation to renew irrigation, fish stocks, and farmland. This research is examining lake shrinking and livelihood changes in the context of multiple stressors through a case study of "lake Chad of" with the help of remote sensing data, in the continent of Africa, research on Livelihoods about regions shows declined in water body fluctuations has largely focused on the wellbeing and security of people on the lake shore. The demonstrates that limited opportunities outside agriculture, the influx of mixed ethnic migrants, boko haram of northern Nigeria which is terror group occupy lake part of Nigeria that lead people of the area migrate as refugee to other state and city of Maiduguri and the increasing spate of violence all enhance livelihood changes. Livelihood opportunities centre on the renewal effects of seasonal floods pulses on lake waters and learning opportunities triggered by past droughts. Although the reverse of the water body has brought new adaptive changes to the shore of basin behaviors on seasonality, traditional prognostic factors and availability of assets, responses have remained largely reactive. The research is focus on the factors responsible for the changes in socioeconomic activities of the people who are reside on the lake shore, and suggests that awareness of the particularities of the mechanisms that connect lake drying to livelihoods can offer insights into the ways local people might be assisted by governments and other donor agencies.*

Key Words: *Lake Chad, shrinking, lulc.*

1. INTRODUCTION:

Water bodies is the part of the earth's surface covered with water 3/4 of the earth's surface is surrounded with water. Water is distributed throughout the planet earth in different forms and shapes, called the various water bodies. The water bodies are of different right from the largest ones like ocean and seas and smallest ones such as ponds size and. "they invaded our territorial waters"; "they were sitting by the water's edge"

Lake is an area of varying size locked with water, constrained in a basin, which is covered by land, except from any river or other outflow that serves to supply or drain the lake. Lakes lies on land and are not link to the ocean, and therefore are marked from lagoons, and are also bigger and deeper than river and ponds, though there are no official or scientific definitions. Lakes can differ from rivers ponds or streams, which are normally flowing. Most of the lakes are drained and fed by streams rivers. (perttiheionen 2000). Natural lakes are generally found in mountainous areas and as well as plain areas of Africa, rift zones, and areas with ongoing glaciations. Other lakes are found in endorheic basins or along the courses of mature rivers. In other regions of the globe, there are many lakes because of disordered drainage patterns left over from the last Ice age. All lakes are temporary over geologic time scales, as they will slowly fill in with sediments or spill out of the basin containing them. (Carmouze et al 2000).

2. MATERIALS AND METHOD:

Methodology is the systematic, theoretical analysis of the methods applied to the field study Remote sensing data the following are the method that was carried out in this dissertation.

Data Collection

Multi -temporal Landsat (WRS2: 184/51, *185/50,* 186, /50, and *184/50)* TM (dated march 1975) ETM+ (dated march 1985) and (L08÷ dated *2005)* and ETM (February 2017) imageries remote sense dataset were assembled and analyzed for land use land cover and lake changes in the study area. The spatial resolution of one pixel of ETM+, TM and L08+ IMAGE WAS 30m and by 30 m and second it was pixels is 60m by 60m. Ancillary data and software packages

County-level topographic map geologic map, socio-economic map, meteorological data, and all the thematic layers were generated in GIS environment at the scale of 1:25000. The software packages used for this research were ERDAS for image processing, ARCGIS and ENVI for analyzing and presenting the result.

Steps

i. Pre-processing of images: the pre-processing for the dataset included image registration, radiometric calibration, and radiometric normalization. Rectification and registration of TM and ETM+ imageries were based on control points collected from vector files of the lake at the study area using thirty ground control points (GCP). The satellite dataset was corrected geometrically in the datum WGS84 and projected. UTM N38 using the first order (linear) of polynomial function and closest Neighbor rectification re-sampling, which was chosen in order to preserve the radiometry and spectral data in the imagery Image-to-image registration was done in order to register the ETM+ image (dated 2017) with geo-coded TM image dated 2005 (master image). And ETM image (dated 1975) with geo-coded TM image dated 1985. The RMS error of the image-to-map was 0.30 to 0.60 pixels, while it was 0.10 to 0.35 pixels with image-to- image registration. The Land sat imageries were radiometric calibrated for sensor differences, converted into spectral radiance and normalized for illumination properties through differences in sun-elevation angle and sun— earth distance by recalculating the pixel values into at-satellite reflectance.

ii. Post-processing of images: Two interaction goals followed in this study. In the first stage, remote-sensing techniques are used in evaluation of surface changes and determination of the type of land use classes. In the next stage, the area is evaluated for environmental change by using a prominent land degradation indicator method and GIS tools and then to analyze the impacts of lake shrink/cover class expansion on environmental degradation. The geometrically rectified and radio-metrically calibrated TM, L08, ETM+ bands 1, 2, 3, 4, 5, were used to derive the studied indices. Satellite-derived index images were produced to portray surface changes. In this research, two methods were used to retrieve class boundary, namely, unsupervised classification (A ISO cluster unsupervised classification) and indices. The five indices covered in this study were tested for vegetation changes; Normalized Difference Vegetation Index (NDVI), Build-up Index (NDBI), Water Index (NDWI), salinity Index (NDSI), and Topsoil Grain Size Index (GSI) were calculated on basis of the following equations, respectively: Normalized Difference Vegetation Index (NDVI).

3. RESULT AND DISCUSSION:

1975 Unsupervised K-Means' image statistic

The image from the map shows the whole lake is full of water across all its coverage area with very Small Island dispersed throughout the area. 1975 water analysis shows that water occupies about 52% in area, vegetation covered about 22 while sand with moisture covered about 15% and dry sand covered about 11%. Coverage in 1975 is shown below by the map of the Lake of that year, pictorial presentation of these is given below.

Table 1. Distribution of land cover 1975

Land Cover	Water Body	Vegetation	Sand with Moisture	Dry Land
Area (Km^2)	15447.59	6624.74	4536.26	3109.72

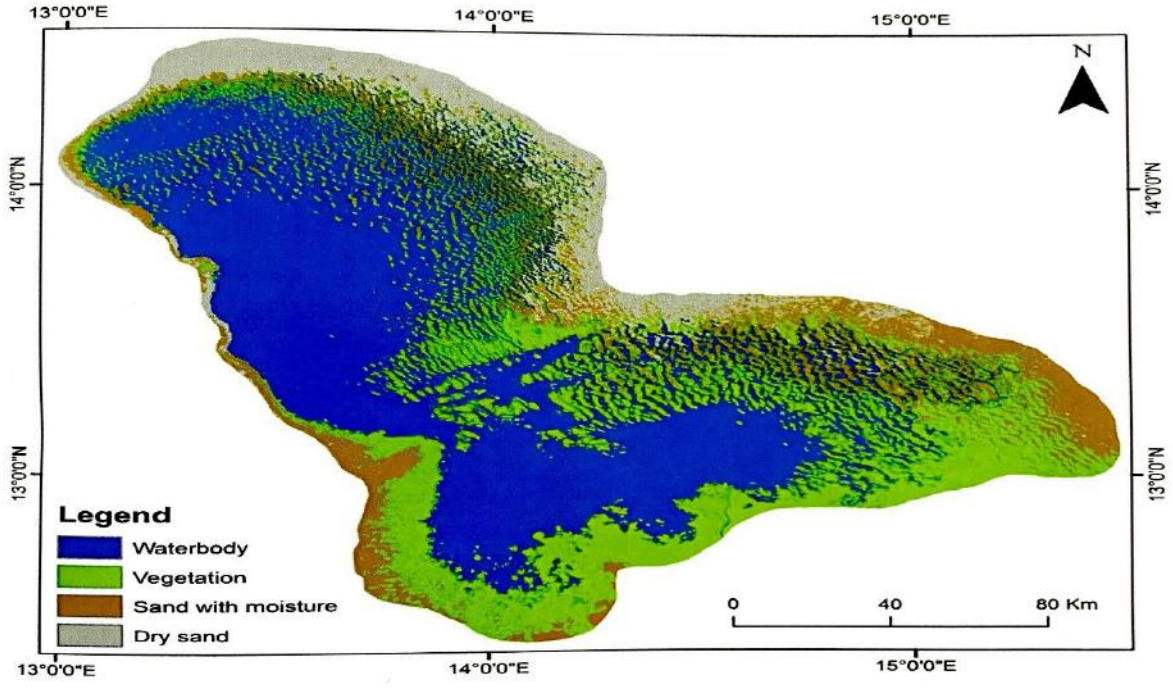

Fig. 1. 1975 Map of Lake Chand

1985 Unsupervised K-Mean's image statistic

In 1985 map of the lake as shown below, there is a major decrease in the area covered by water which used to be *52%* in 1975 to about 24% while vegetation area decreased from 22% to 14% dry land also increased due to the massive shrinking within this period from about 11 % to 37%. This shows that water body, vegetation and sand with moisture have decreased. These are illustrated.

Table 2. Distribution of Land Cover 1985

Land Cover	Water Body	Vegetation	Sand with Moisture	Dry Land
Area (Km^2)	7,088.00	4,329.00	7,359.00	10,952.00

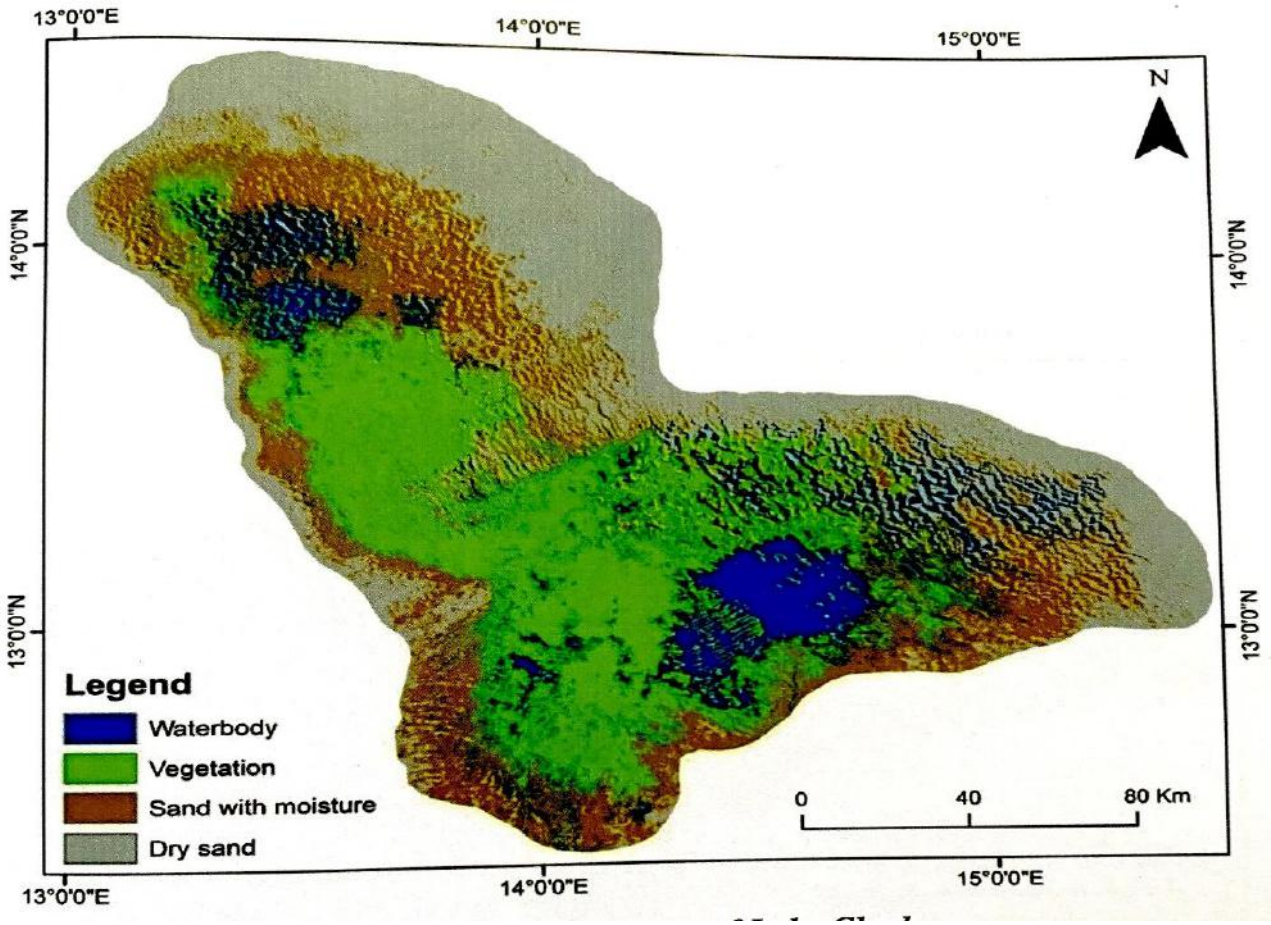

Fig. 2. 1985 Map of Lake Chand

2005 Unsupervised K-Means Image Statistics:

In the year 2005, there was a substantial shrinkage in the Lake Chad with a large increase in dry land and higher amounts of vegetation and moisture sand as depth across the lake decreases. The size of water coverage in 2005 was about 24% and vegetation was estimated to be 9447.6771 km^2. Sand with moisture was roughly about 7556.7005 km^2 and about 8786.1195 km^2 was comprised of dry sand cover. It can be seen from the table and graph below that the shrinkage shown in the map beneath is highly shrunk.

Table 3. Distribution of Land Cover 2005

Land Cover	Water Body	Vegetation	Sand with Moisture	Dry Land
Area (Km^2)	3,918.01	9,447.68	*7,556.70*	9,786.12

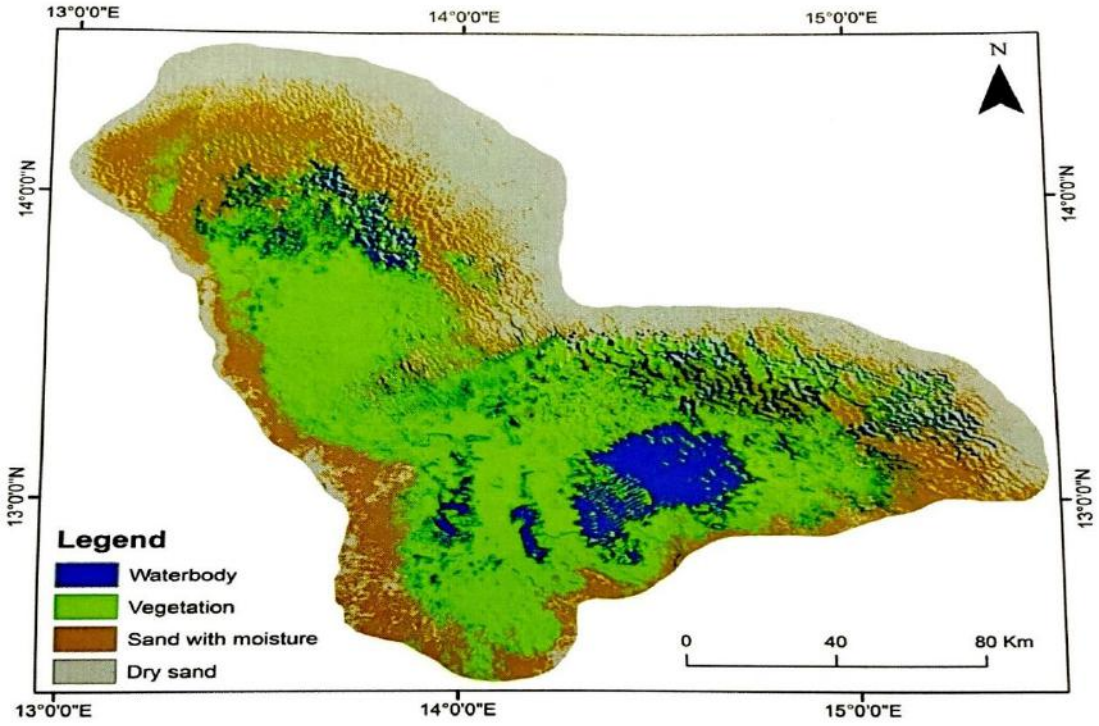

Fig. 3. 2005 Map of Lake Chand.

2017 Unsupervised K-Means Image Statistics:

Between 2005 and 2017 there was a very small difference in the shrinkage rate, it is depicted in the map of the lake shown below. Level of water body is about 3,444.60km^{2}vegetation covered about 5,961.25km^2 while moisture sand was estimated to be 9,265.23 km^2 and dry land covered about 11,047.68 km^2.

Table 4. Distribution of Land Cover 2017

Land Cover	Water Body	Vegetation	Sand with Moisture	Dry Land
Area (Km^2)	1,444.60	5,961.25	10.265.23	12,047.68

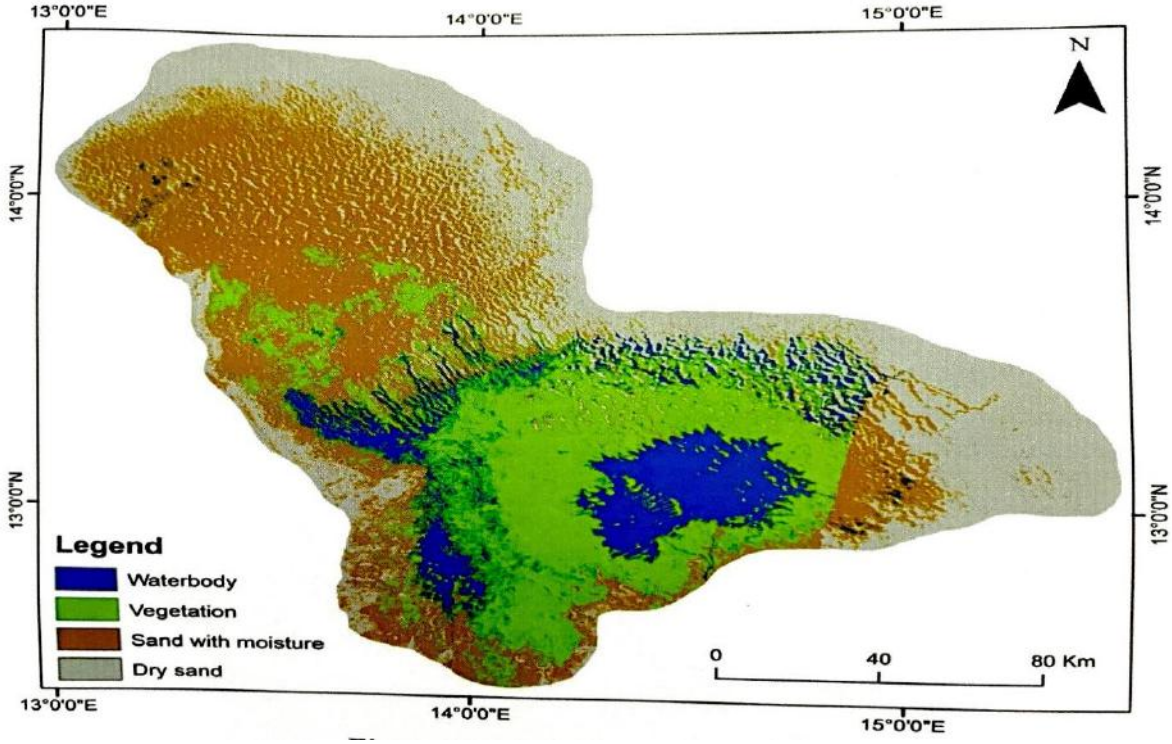

Fig. 4. 2017 Map of Lake Chand

4. CONCLUSION:

This research attempted to highlight some of the main issues that concerning to the Lake Chad. The main factors affecting the Lake are mentioned. The Importance of the Lake in sustaining livelihood systems is stated. The predicament of the Lake and the uncertainty of its future that in existence are expressed, there is growing perception and concern at national, local and international levels over the control of the Lake and the dependent population. It is on this basis that efforts are being made to apply various management strategies to regaining the Lake. At the national level, many actions have been initiated to manage the disappearance Lake resources. The locals are in different farming and fishing technique to derive to the changing situation.

REFERENCES:

1. Coe, Michael T, Foley J.A (2001), "Human and natural impacts on the water resources of the Lake Chad Basin". Journal of Geophysical Research, 106 (D4): pp.3340-3356.
2. Carmouze, J. P. & Lamoille, J. (1983), The lacustrine environment. "Lake Chad" pp. 27-64. Dr. W. Junk Publishers, The Hague.
3. Pertti Heinoneon, Hydrology and limn logical aspect of lake monitoring textbook, published in 2000, pp. 4-6.
4. Lal R (1994) Tillage effects on soil degradation, soil resilience, soil quality and sustainability. soil tillage research. pp,18-27.
5. Michael T et al., (2001) Human and natural impact the water resources of the Lake Chad Basin. Journal of Geography research, Vol -106 no. D4 on, pp. 3349-3356, Feb 27, 2001.
6. Prof Savindra Singh, Environmental Geography, Pravalika publications, Allahabad University, pp. 339-351.
7. Food and Agriculture Organisation (FAO) (2012), Climate change implications for fishing communities in the Lake Chad Basin. Food and Agriculture Organisation Fisheries and Aquaculture Proceedings 25, Rome, Italy.
8. McCubbin, S., B. Smit, and T. Pearce. (2015). Where does climate fit? Vulnerability to climate change in the context of multiple stressors in Funafuti, Tuvalu. Global Environmental Change 30: pp.43-55
9. Giwa (2012), Global International Waters Assessment Lake Chad Basin, GIWA Regional assessment 43 Published by the University of Kalmar on behalf of United Nations Environment Programme
10. Victoria, Tanganyika and Nyassa, (1964). The Lake Chad Basin Commission (LCBC)
11. World Meteorological Organisation (WMO).
12. Sarch M T and Birkett C (2000), Fishing and fanning at Lake Chad. responses to lake-level fluctuations Geography. 166 156—72.
13. Leblanc, M., J. Lemoalle, I. Bader, S. Tweed, and L. Mofor. (2011). Thermal remote sensing of water under flooded vegetation: New observations of inundation patterns for the 'Small' Lake Chad
14. FAO (2002): Land Degradation & Rehabilitation Philosophy & History: First Meeting of Technical Advisory Group for LADA — FAO, Rome, January 2002
15. Sanyu Consultants inc. (2001), The Study on the integrated Rural Development Project in the United Nations Environmental Programme (UNEP) (1992): Land degradation.GEO-3: Global Environmental Outlook.
16. Odada, E., L. Oyebande, and J. Oguntola. (2006), Lake Chad: experience and lessons learned. http://www .worldlakes.orgluPloadS/06_Lake_Chad_ 27February2006.pdf.
17. Carmouze, J.P., Fotius, G., & Lévêque, C., (1978), Influence qualitative des macrophytes sur la regulation géochirrnque du lac Tchad. Cah. ORSTOM, Sér. Hydrobiol., 12 : pp.63-65.
18. Singh A, Diop S and M 'mayi P L (2006), Africa 's Lakes: Atlas of Our Changing Environment (Nairobi: UNEP)
19. Nindi, S.J. (2007), Changing livelihoods and the environment along Lake Nyasa, Tanzania. African Study Monographs, Suppi. 36: pp. 71-93

20. Kreamer, D.K. (2012). The past, present and future water conflict and international security. Contemporary Water Research and Education, 149: pp. 88—95
21. Gao, H., T. Bohn, E. Podest, K. McDonald, and D. Lettenmaier. (2011). On the causes of the shrinking of Lake Chad. Environmental Research Letter 6: 1 - http://www.esrj .comlarcgis/about-arcgis
22. Campbell R W (2008), Lake Chad. West Africa: 1963, 1973, 1987, 1997, 2007 Earthshots: Satellite Images of Environmental Change (Reston, VA: US Geological Survey) (available at http ://earthshots.usgs.gov)
23. Sarch M T and Birkett C (2000), Fishing and farming at Lake Chad: responses to lake-level fluctuations, Geography. J. 166 156—72.
24. Liang X, Lettenmaier D P, Wood E F and Burges S J (1994), A simple hydrologically based model of land surface water and energy fluxes for general circulation models J. Geophys. Res. 99 14415—28. Available on - https://agupubs.onlinelibrary.wiley.com/doi/abs/10.1029/94JD00483
25. Leblanc, M., J. Lemoalle, J. Bader, S. Tweed, and L. Mofor. (2011), Thermal remote sensing of water under flooded vegetation: New observations of inundation patterns for the 'Small' Lake Chad. Journal of Hydrology 404: pp. 87—98.
26. Odada, E., L. Oyebande, and I. Oguntola. (2006), Lake Chad: experience and lessons learned. Retrieved November 26, 2014, from http://www.worlcilaices.org/uploads/O6 Lake Chad_ 27February 2006.pdf.