

**GEOGRAPHIC INFORMATION SYSTEM
(GIS) BASED PREDICTIVE STUDY OF
ENVIRONMENTAL CHANGE IN THE
NIGERIA'S SECTION OF THE CHAD BASIN**

BY

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**A THESIS SUBMITTED TO THE DEPARTMENT OF
GEOGRAPHY, OBAFEMI AWOLOWO UNIVERSITY
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**IN PARTIAL FULFILMENT OF THE REQUIREMENT
FOR THE AWARD OF DEGREE OF DOCTOR OF
PHILOSOPHY (PH.D.) IN GEOGRAPHY**

DECEMBER, 2008

ABSTRACT

The study characterized the spatial patterns of changes in land and water uses in the Chad basin between 1963 and 2003; assessed the spatial patterns of land and water uses during the period; modeled future trends in environmental change in the area, and evaluated the strategies with which local communities were responding to the increasingly unfavourable environment of the Basin. These were with a view to providing an understanding of the dynamics of land and water uses in the basin.

Primary and secondary data types were used. The primary data on the socio-economic activities and drought coping strategies of people living in the Baga and Southern Chad project sections of the study area were obtained using a questionnaire. The populations of the communities in the area were between 2000 and 2500 and a sample size of approximately 2.5% (500) was taken. Five communities were randomly selected from the 21 in Baga and another 5 from the 24 in Southern Chad area. In each community, 50 copies of the questionnaire were administered on 50 household heads. To select the households, all households in each community were listed orderly. Fifty of these were then systematically selected, the k^{th} value being generally about 40. Also, hydro-climatic records on rainfall, temperature and water levels from synoptic stations in the Basin between 1960 and 2002 were obtained. The data sets were summarized and trends analyzed using the second degree polynomial regression. Remote sensing images of the area were also obtained and analyzed with Integrated Land and Water Information System (ILWIS). The Markov chains modeled was used to

develop a transition rule for future land uses. The resulting statistics were modeled with linear regression to simulate future trends.

The results showed that the "water surface" category of landuse which was the driving factor, reduced from 1,135,208 hectares (61.2%) in 1963 to 207,880 hectares (11%) in 1975, 143,833.6 hectares (7.6%) in 1987, and then began to increase reaching 149,752 hectares (7.9%) in 1999 and 184,436 hectares (9.8%) in 2003. In the same vein, "regularly flooded sites" reduced from 383,040 hectares (20.3%) in 1975 to 170,640 hectares (9.0%) in 1987 and 51,468 hectares (2.7%) by 2003. Furthermore the environment had been unsupportive of the rural economy of the inhabitants in droughts. The people had weak adaptive capability for drought as 24.7% depended on the previous harvests, about the same proportion "did nothing" to cope while some 4.1% migrated to nearby countries. In addition, there had been changes in hydro-climatic parameters of the Basin. Annual rainfall rose from about 400 mm in the 1960s to more than 600 mm in 2002 in N'Djamena Aero, which supported the idea that the environment may already be getting wetter. Besides, the study showed that "dryland category" could increase to 2.23million hectares in five years times i.e. about twice its value for 2003. However, the probability of this occurring was 0.29, i.e. the dry land may actually reduce. Similarly, "water surfaces" category could increase to 32,259 hectares by 2008 with a probability of 0.41. Thus, yearly it is expected that there would be an increase of approximately 10,000 hectares in "water surfaces".

In conclusion, the study showed that important changes had taken place in the Chad Basin which could make the Basin wetter in future.