

## ON THE EFFECTS OF GEOLOGICAL AND HYDROMETEOROLOGICAL FACTORS ON FAILURES AND DISTRESSES OF EARTH DAMS IN NORTH EASTERN NIGERIA

UMARU A. B<sup>1</sup>, SANGODOYIN, A. Y<sup>2</sup> & OKE, I. A<sup>3</sup>

<sup>1</sup>Department of Agricultural and Environmental Engineering, Modibbo Adama University of Technology,  
Yola, Nigeria, African

<sup>2</sup>Department of Agricultural and Environmental Engineering, University of Ibadan, Ibadan Nigeria, African

<sup>3</sup>Department of Civil Engineering, Obafemi Awolowo University, Ile- Ife, Nigeria, African

### ABSTRACT

Forty two earth dams were randomly selected and investigated in North-Eastern Nigeria to determine the geological and hydrometeorological factors responsible for their failures and distresses. The Association of State Dam Safety Officials (ASDO) method was used to assess failures, distresses and functionality following a collection of data from Upper Benue River Basin Development Authority, States Ministries of Water Resources and the Nigerian Meteorological Agency. Site visits to randomly selected dams in the study area was done for observations and measurements. The geology of the study area is composed of Basement complex, Alluvium, Tertiary to recent Volcanics, Bima and Gombe Sandstones, Pindiga and Yolde formations, Granites and Igneous rocks among others. Of the dams sited on the Basement complex, 61, 27 and 11% were functional, failed and distressed respectively. The dams on Younger granites have an even number of failures and functionality. All the dams on Gombe sandstones and Pindiga formations are functional. The status of the dams were affected by two opposing scenarios, viz; the peak rainy season of August to September with monthly total rainfall ranging from 327.1mm to 478.8mm which recorded 75% of failures and distresses due to erosion, siltation and subsequent flooding. The dry season spanning October to February with monthly evaporation ranging from 354.6mm to 409.7mm and high temperatures in the range 39 - 43<sup>o</sup>C witnessed 20% of dam failures with excessive loss of reservoir water by evaporation.

It is suggested that adequate geological and hydrometeorological studies be conducted and data used to guide construction and reservoir operations. Grouting, Impervious blanket, incorporation of cut-off wall and some form of soil stabilisation of earth dams is necessary to enhance stability and minimise seepage.

**KEYWORDS:** Dam Failures, Geology, Hydrometeorology, North-Eastern Nigeria