



TECHNIQUES OF REDUCING FLOOD IN THE SAVANNAH REGION OF JIGAWA STATE FOR ADEQUATE FOOD SECURITY

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Abstract

The Nigerian Savannah is sometimes affected by flooding that leads to the destruction of farmlands and houses leading to poverty within the region, many researchers had been providing so many solutions to such kinds of environmental disasters across the world, yet the problem persists, because the environment lacks a technology that will solve the problem in Architecture, Engineering and Construction industry. This study was conducted along the Hadejia river that crosses through some local Government of Jigawa state, the local Governments includes Ringim, Taura, Miga, Auyo Kafin Hausa and Hadejia, the research method used was mixed methods, these are; the qualitative and quantitative approach, the qualitative approach includes the reconnaissance survey, field data collection, existing data. while the quantitative method includes the Satellite Image Processing and Analysis, a familiarity visit to the area under investigation was carried out, after intensive fieldwork, in which the samples/data were collected across the study area, and a TCX converter software was used to determine the longitudes and latitudes of the study area, Quikgrid was used to convert the available data to contours of the study area. Their elevations were as follows: Highest from Ringim which is 392M to Lowest toward Hadejia which is 346M with intervals of 2M between contours height, the results show that the flooding will be higher in Hadejia because it has the lowest elevations, after intensive calculations, the solution provided for the disaster was a creation of dunes and Oasis using AutoCAD software and Realtime Landscape Architects to solve the

problem in the perspective of Landscape Architecture, a 10,000 Meter cube area was used as a sample in the part of the study area and closed to the waterways, a design was produced and evaluated, the result shows that initially, the sampling area was accommodating only 30,000 Meter cubes at the maximum height of 3-meter flooding of the existing data, after the calculations and the design of Oasis creation and dunes along the higher contours, the result shows that each sampling area will accommodate more flooding under the ground, this result can be multiplied by millions of the same samples. And the second result was the dunes created will allow for farming, planting of medicinal trees, fruit trees, fishpond and wildlife survival. This will serve as a menace after the disaster, and also a preventive measure before or during the next flooding if available. The proposal will boost food security in the area and create more job opportunities for the people of Jigawa State and beyond.

Keywords: *Flooding, Landscape Architecture, Savannah, Technology*

Introduction

Speaking to Daily Nigerian on the sideline of the International Climate Change Conference organised by the African Climate Change Research Center in Dutse, on 27th March 2021 (para.4), Mr Jibo warned that:

Earth observation satellite data has already shown that disaster is looming. "Climate change is the major cause of the massive flooding we are witnessing today globally. If you just take a look at what happened in the year 2020 between 13 and 19 September, a heavy downpour that ravaged global communities, especially in Al Tayeb in Saudi Arabia, Valencia, Magarya, Auyo, Kafin Hausa, Ringim is quite alarming.

All these places were ravaged by climate change. Human actions and inaction have also contributed to warming the atmosphere. The case of Hadejia is peculiar because Hadejia has fallen squarely under Hadejia Jama'are River Basin and Komadugu Wetland. Since it is directly on the

water tributary that channels itself into Lake Chad, it has no choice whatsoever but to start thinking of a relocation plan. Why because if you see the volume of flood rains in Hadejia, it went to an extent that an oil tank that was buried underground had to be flushed out by underground water. That is to show you the level of the water table that has risen due to climate change. And there is already a sea-level rise of 0.05 per cent. So that is why you can't avoid this climatic disaster.

Based on the research we have carried under and Group on Earth Observation (GEO) in Geneva and under United Nations Framework Convention on Climate Change, earth observation satellite data has already shown that in the next two years, there is a tendency of landslide in Hadejia, Auyo and Birniwa. This is current satellite data. But based on the in-situ data, out of 27 local governments in Jigawa State, 18 were submerged by floodwaters. What are we talking about? All the indicators are there. We have already passed a red alert. Also, we have already passed early warning signs. We are now under red alert. And there is a town in the Niger Republic that had fallen squarely in the same position as Hadejia. The water runoff started from there, traverses and channels itself into Hadejia. Even the Niger Republic waters came and channelled itself into Hadejia River Basin. That is the reason for massive flooding in 2020,

Many researchers had been providing so many solutions to such kinds of environmental disasters across the world, yet the problem persists. Because the built environment lacks a technology that will solve the problem in Architecture, Engineering and Construction industry.

Technology is the application of scientific knowledge to the practical aims of human life or, as it is sometimes phrased, to the change and manipulation of the human environment (Huesemann, M.H. & Huesemann, J.A. 2011).

The natural environment or natural world encompasses all living and non-living things occurring naturally.

Since Landscape Architecture profession is a profession that involves the systematic design and general construction of structures for the use of living things, investigation of existing social, ecological, and soil conditions and processes in the landscape, and the design of other interventions that will produce desired outcomes (Geoffrey & Susan 1987). The research, therefore, provides a design technology that will reduce flooding impact in some part of Jigawa state.

Methodology

In this chapter, the various processes used in generating, processing and presenting data for the research was discussed. The research method used was mixed methods (CR Kothari 1995). These are; the qualitative and quantitative approach, the qualitative approach includes the reconnaissance survey, field data collection, existing data. while the quantitative method includes the Satellite Image Processing, calculations and Analysis.

Reconnaissance survey

At this stage, a familiarity visit to the area under investigation was carried out. The purpose of the reconnaissance survey is to identify major land use classes in the study area. This information is very essential and pre-requisite to the study.

Field data collection

After a comprehensive reconnaissance survey, a field data collection was followed. The geographic coordinates (latitude and longitude) of some training sets were collected using a Global Positioning System (GPS). The coordinates helps in generating contours.

Satellite image processing

The Google image area of the study was downloaded using a Google earth pro image Landsat Copernicus 2022.

TCX converter

TCX converter is an affordable and easy-to-use GIS Data processing application that offers access to an unparalleled variety of spatial datasets and provides just the right level of GIS functionality to satisfy both

experienced GIS professionals and mapping novices. Equally well suited as a spatial data management tool and as an integral component of an enterprise-wide GIS, TCX converter software was used in order to process the Longitude and Latitude of the area to determine the elevations of land area under study.

Quikgrid

Quikgrid is a program which will read in a set of scattered data points (x, y, z) which represents a surface. The program will generate a grid from this data and then display the surface as a contour map, or as a 3d representation.

AutoCAD Design

Computer-Aided Design(CAD) or

Computer-Aided Design and Drafting (CADD) was used in the creation, modification, analysis, or optimization of a design.

Realtime Landscape Architect

Realtime Landscaping Architect is also an ideal companion title for enabling you to create detailed three dimensional landscapes. With a comprehensive database of plants and objects as well as tools specifically designed to add pools, ponds, decks and patios. The software was used in order to create the sand dunes of the study area.

The study area



Figure 1: Google Map showing the study area

The study area include Ringim, Miga, Auyo, Hadejia and Kirikasamma, The

Hadejia-Nguru floodplains are situated in the Komadugu-Yobe Basin in NE Nigeria, along the fringes of the Hadejia and Jama'are rivers. Figure 1 below shows the google map of Jigawa state, while figure 2 shows the River crossing through the study area, The Plate 1 shows the collapsed Farmlands and road along the Hadejia Road as a result of flooding in 2020, Plate II and III also shows some parts of the flooded town.

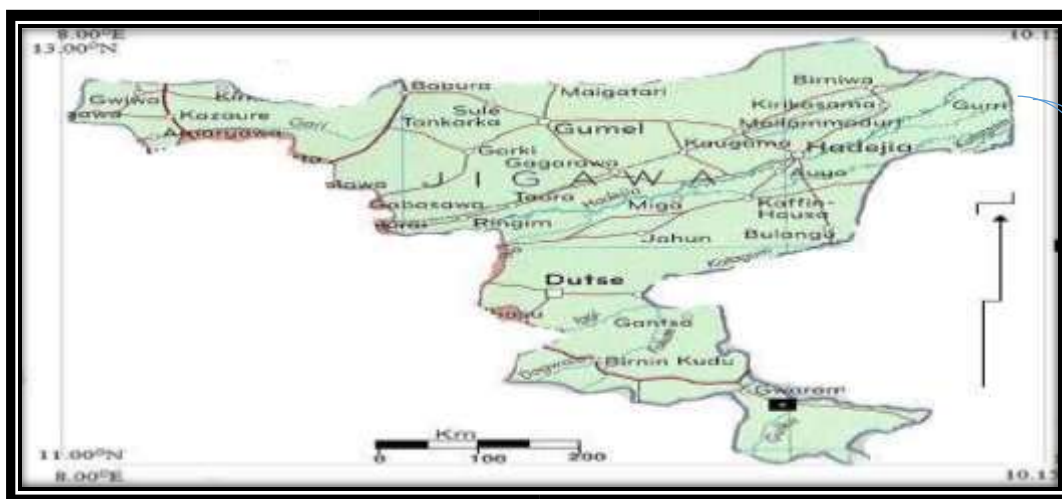


Figure 2 Map of Nigeria showing the study area.

Source: Nigeria Map and World atlas 2020

Source: Google Earth Pro 2022.

Source: Author's Compilation 2020.



Plate I Picture of the Collapsed Hadejia Gujungu Road



Plate II Picture of the parts of the Hadejia Town.
Source: Author's Compilation 2020.



Plate III Picture of the A.P fluctation were fuel underground tank boost out.
Source: Author's Compilation 2020.

Results

After intensive fieldwork, in which the samples/data were collected across the study area, a TCX converter software was used to determine the longitudes and latitudes of the study area, Quikgrid was used to convert the available data to contours of the study area . They elevations were as follows: Highest 392M to Lowest 346M with an intervals of 2M between contours as shown in figure 3 below, the colour contours were also

generated using the quikgrid software as shown in figure 4 below, likewise the 3D coloured contours as shown in figure 5 below.

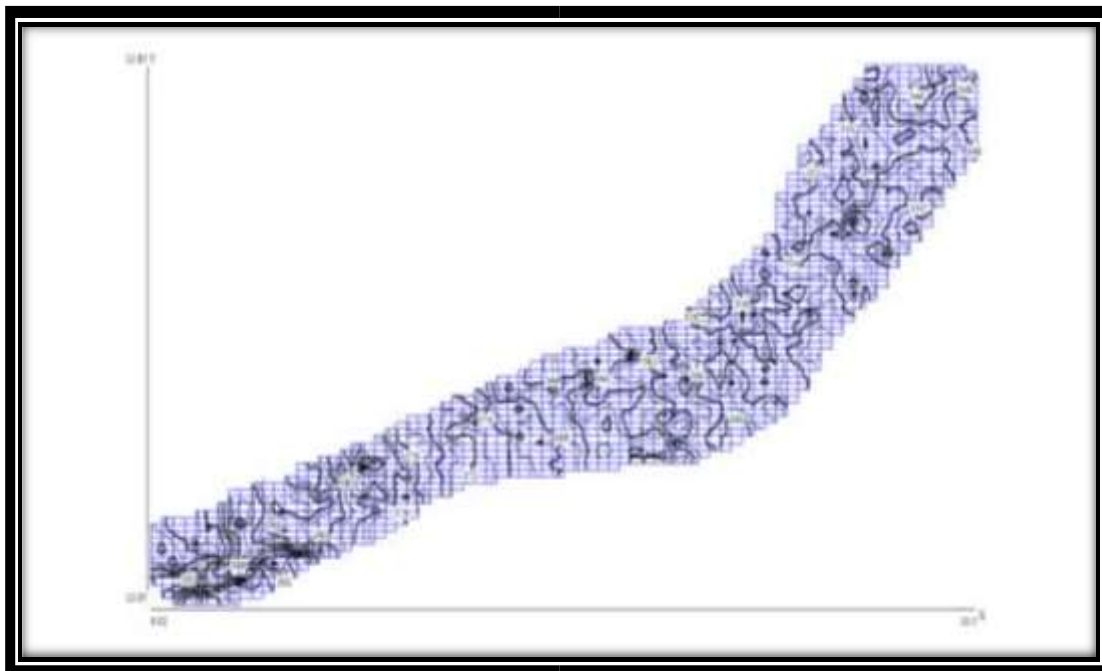


Figure 3 2D Contours of the study area.

Source: Source: Author's Compilation 2022.

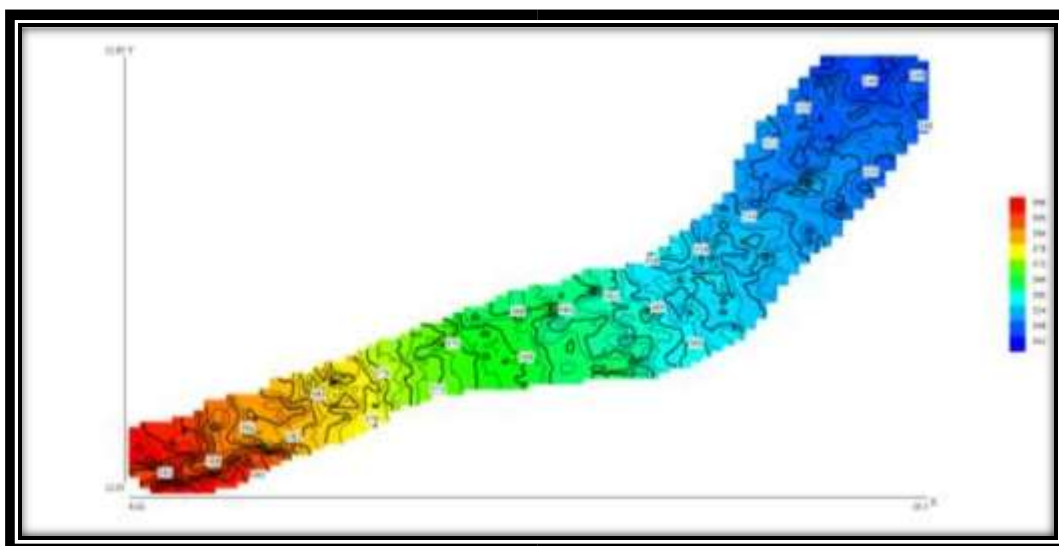


Figure 4 2D Coloured Contours of the study area.

Source: Source: Author's Compilation 2022.

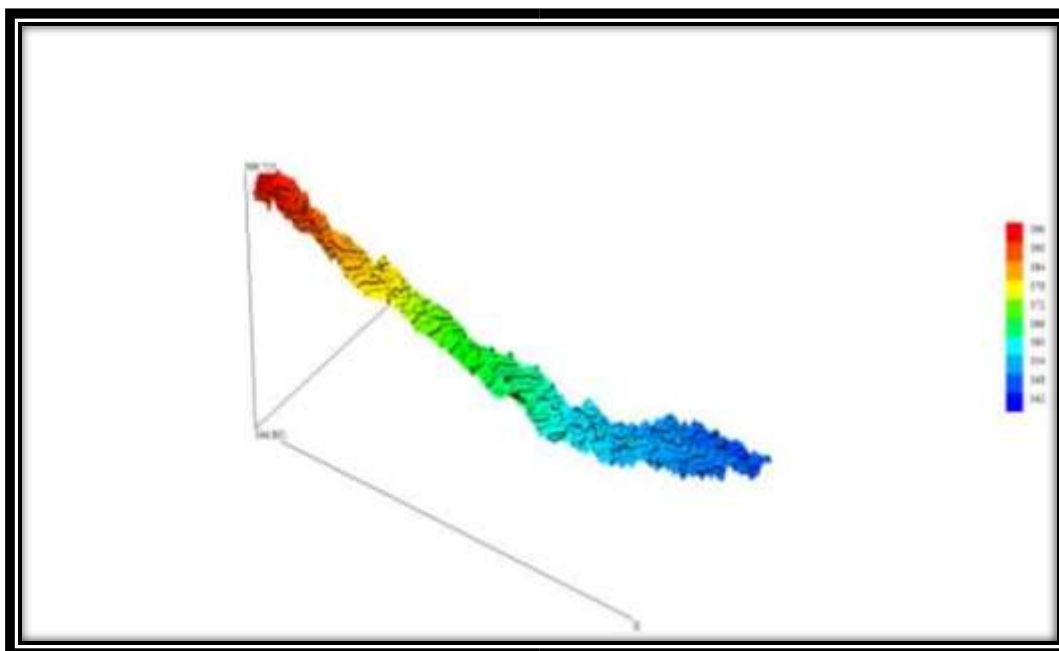


Figure 5 3D Coloured Contours of the study area.
Source: Source: Author's Compilation 2022.

Discussion

Many professionals had been providing solutions to a flooding disaster, but yet good result was not abstained. The technology used in this study was contours generating and design analysis, previously when there was flooding in the area of the study, the flooding used to destroy farmlands in Jigawa state area of the study. In figure 6,7 and 8 below, a $10,000M^3$ area was used as a sample in the part of the study area and closed to the waterways, a design was produced and evaluated, the result shows that initially, the sampling area was accommodating only $30,000M^3$ at the maximum height of 3M flooding of the existing data, after the calculations and the design of Oasis creation and dunes along the higher contours, the result shows that each sampling area will accommodate more flooding under the ground, this result can be multiplied by millions of the same samples. And the second result was the dunes created will allow for farming, planting of medicinal trees, fruits trees, oasis, fishpond and wildlife survival. This will serve as a menace after the disaster, and also a preventive measure before or during the next flooding if available. The

proposal will allow for farming, planting of medicinal trees, fruits trees, oasis, fishpond and wildlife survival. This will serve as a menace after the disaster, and also a preventive measure before or during the next flooding if available. The proposal will boost food security in the area and create more job opportunities for the people of Jigawa State and beyond.

AutoCAD Drawing

AutoCAD 2010 software was used to produce the sampling area of 100M by 100M as shown in figure 6 and the section in figure 7 below.

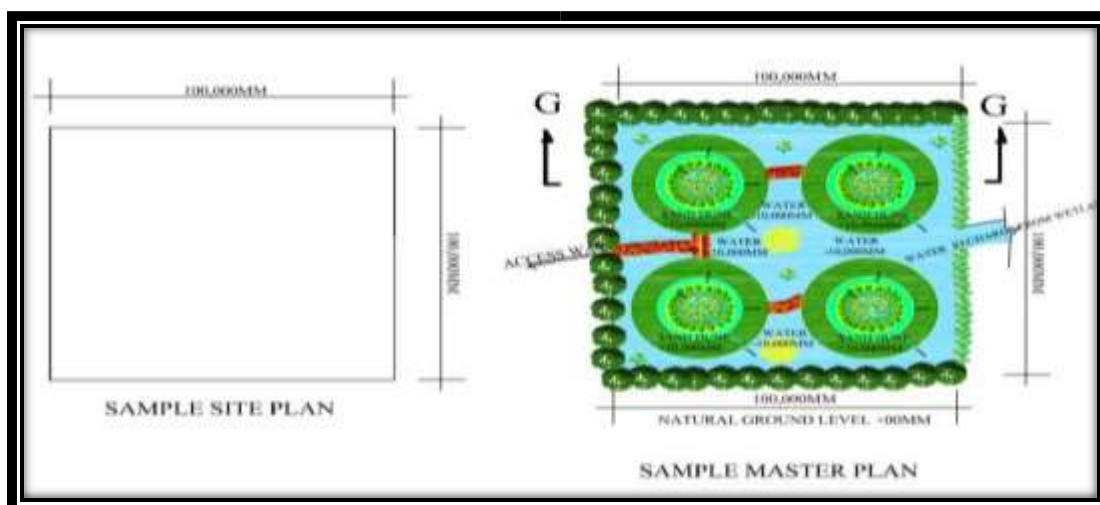


Figure 6 AutoCAD drawing showing the sampling area of the study.

Source: Author's Compilation 2022.

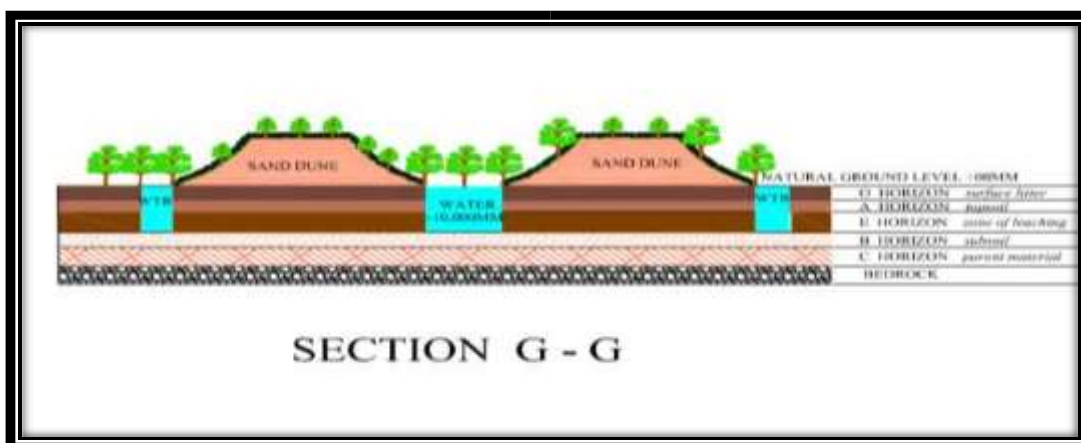


Figure 7 AutoCAD drawing showing the section of the sampling area of the study.

Source: Author's Compilation 2022.

Realtime Landscape Architect

Realtime Landscape Architect was used to create the 3D (Three dimensional Drawing of the study area as shown in figure 8 below



Figure 8 Drawing using a Realtime Landscape Architect the 3D of ~~area of the~~ study.

Source: Author's Compilation 2022.

Recommendation

Many professionals had been making so much research regarding flooding in Nigeria and beyond, yet the results of controlling the flooding were not very effective, the researcher in this study recommends the followings; Government should engage Landscape Architects in all aspects of the Built environment, Ecological Landscape and beyond, Government should add more schools of Landscape Architecture in the country, Government should license the existing Landscape Architects in the country. Non Governmental Organisations working on environmental aspects should also engage Landscape Architects to contribute in saving our natural environment.

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