

# ANALYSIS OF THE POTENTIALS OF DADIN-KOWA AND BALANGA DAM SITES FOR SUSTAINABLE TOURISM DEVELOPMENT IN GOMBE STATE, NIGERIA

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## Abstract

*This research examined the potentials of Dadin-Kowa and Balanga dam sites for sustainable tourism development in Gombe State. The study mapped out the physical setting of Dadin-Kowa and Balanga dam sites, identified the Dadin-Kowa and Balanga dams potentials for sustainable tourism development and the constraints that delimit the development of the dam sites for tourism development. The methods used for data collection were administration of 130 questionnaires and ground truthing as well as weighing of the various variables of the individual dam sites. The data were analyzed using descriptive analysis (tables), inferential statistics (one sample test) and spatial analysis (GIS). The research revealed that the volume of water in the two dams is adequate for domestic use, HEP generation, irrigation and tourism industry. It also depicts that the physical setting in form of scenery and open spaces around Dadin-Kowa dam constitute 21.28km<sup>2</sup> (21.28%) while Balanga dam has 19.61km<sup>2</sup> (19.61%). Constraints delimiting the development of the dam sites and their test values include insufficiency of funds (49.2) and lack of awareness (37.4). Sequel to these findings, it is recommended that government recognizes the potentials for developing the dam sites for tourism, draws out a comprehensive plan and commits sufficient funds for total development and monitoring of the industry in the state.*

**Keywords:** Dams, Water use, Potentials, Tourism, Sustainable development

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## Introduction

Water bodies like dams generally hold direct benefit of providing electricity and irrigation but may advertently also provide indirect benefits of recreation and reduce flooding. Tourism as an agent of development has many beneficial multiplier effects. Nigeria as a country is richly endowed with a range of cultural and natural resources relative to other nations in Africa and on a global level, most of which are largely untapped (Atuk,2009). Sustainable tourism can be defined as tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, industry, environment and host communities (United Nations World Tourism Organization, 2015).

It is widely acknowledged in the marketing field that knowing customers, predicting and meeting their needs, wants and expectations are the keys to success. Dam projects are common features on major rivers of the world especially where the necessary conditions are favourable. Before dams are constructed the potentials on ground and purposes they will serve are carefully examined from feasibility studies to implementation of projects and the monitoring of activities of the schemes. Concerned bodies sponsoring the construction of the dams ensure proper utilization of funds and are specifically mindful of further development of dams for multipurpose uses. They are also cautious of the purpose for setting up the projects and ensuring maximum output of set goals.

Development agencies and governments are aware that construction of dams and the purpose for which they are scheduled for may change as needs arises. An activity related to utilising resources at dam sites which has received increasing attention in terms of commitment of funds is the development of dam sites

for tourism industry as identified by Ajibade et.al (2013) whose study on Kainji Lake National Park revealed that ecotourism activities and income generation in the park has shown a continuous trend in development and much greater hope for the future. Tourism sector has huge potentials yet unexplored, which if fully supported can contribute significantly to economic diversification (Ayeni, 2012).

This research identified the need for further development of Dadin-Kowa and Balanga Dam sites for tourism industry in Gombe State. The focus of the research is to bridge the gap in knowledge between the present state of the dam sites and their development for tourism in the state hitherto not researched into by any author. The analysis of the physical settings of the two dams, their potentials in terms of infrastructure, their economic viability and the constraints delimiting the development of the two dam sites for sustainable tourism is necessary in order to obtain knowledge, information and data needed for the development of tourism on the dam sites. The success of tourism and hospitality industry in any country depends on the ability of that country to sufficiently develop, manage and market the tourism facilities and activities of that country as most developing countries depend mostly on tourism for economic growth and diversity (Njike et.al, 2013).

### Study Areas

#### Dadin-Kowa Dam

Dadin-Kowa Dam is located in Yamaltu-Deba Local Government Area, Gombe State, in north eastern Nigeria at Latitude  $10^{\circ}19'20''N$  and Longitude  $11^{\circ}51'54''E$  (see figure 1). The dam is 36 kilometers away from Gombe town and 5km north of Dadin-Kowa town. It has a reservoir capacity of  $1.77 \times 10^9 m^3$  and was constructed at the lower part of Gongola River a principal tributary of the Benue River to the north, which has its source from the Jos Plateau (Adang et.al, 2015).

Yamaltu-Deba Local Government Area has a tropical continental climate. It is generally warm, with temperatures exceeding  $40^{\circ}C$  during the hottest months of March to May and has a relatively short rainy period and a comparatively long dry period. The rain usually starts in late April or early May and ends late September or early October with a peak in the month of July or August. It has an average rainfall of 600 mm - 900 mm (Kachalla, 2012).

Dadin Kowa is geologically part of the Upper Benue Trough, although the state is an entity of its own, it constitutes a major sedimentary basin, with a fill of about 600m of Cretaceous Tertiary Sedimentary rocks. While the elevation of the plain is at about 300m - 400m above sea level, the hills, for example the Bima Hills, reach between 700m and 800m. Dadin-Kowa dam crested spillway is about 520m above sea level. The Gongola River is the main drainage system, running approximately north-south forming the Borno-Gombe States boundary and joining the Benue River at Numan in Adamawa State (Kachalla, 2012). The dam is within the Sudan Savanna Belt and the natural vegetation cover consists of scattered trees, shrubs and species of grasses (Natural Resource Baseline Survey Gombe State, 2008).

#### Balanga Dam

Balanga dam is located in Balanga Local Government at the south-eastern part of Gombe State, on latitude  $9^{\circ}58'23''N$ , and longitude  $11^{\circ}40'10''E$  (see figure 1). It is about 82km away from Gombe town and has a reservoir capacity of  $73 \times 10^6 m^3$ . The reservoir is found on the River Balanga between two prominent ridges to its north and south (Williams, 2017).

The climate of Balanga dam area is tropical continental, typical of northern Nigeria with distinct dry and rainy seasons. The daily mean temperature ranges from  $22^{\circ}C$  to  $29^{\circ}C$  in August,  $17^{\circ}C$  to  $34^{\circ}C$  in November and  $24^{\circ}C$  to  $36^{\circ}C$  in April. This is because the rainy season has a moderating effect on the temperature, during the winter when the cold harmattan wind with fine dust blows from the Sahara Desert in the months of November to January. The area falls within the Sudan Savannah Vegetation Zone consisting of open grassland. The plants are greatly affected by anthropogenic activities such as bushfire and agriculture resulting in modification of the biosphere. The area is within the upper Cretaceous Terrestrial Sediment, the Bima sandstone (Ibrahim, 2014).

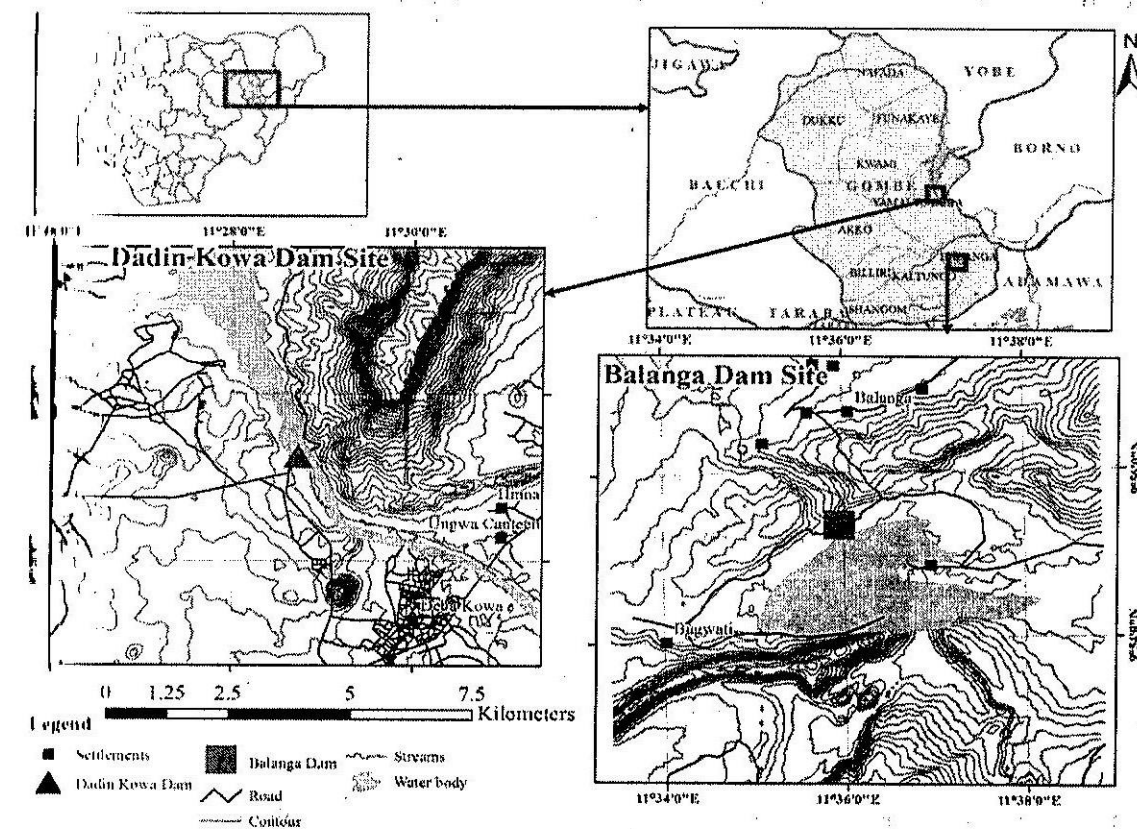


Figure 1: Map of Nigeria showing Gombe State and Gombe State showing the study areas  
Source: GIS Lab. Gombe State University, 2018

### Methodology

The data for the study was obtained from primary and secondary sources. First reconnaissance survey was conducted to familiarize researcher with the study area and identify background information relevant to the study. One hundred and thirty structured questionnaires were administered randomly among the Staff of Ministry of Water Resources, Upper Benue River Basin Development Authority, Ministry of Culture and Tourism, Dadin-Kowa Community and Balanga Community with the help of 2 field assistants. Coordinates of the dam sites were collected with the Global Positioning System. Secondary sources include relevant literature, Landsat TM satellite imageries of 2017, text books and the internet. Imageries (GIS) were used to map out the physical setting of Dadin-Kowa and Balanga dam sites. The potentials of each dam site and constraints delimiting its development were weighed using questionnaires and further analysis was done on the physical setting of the dam sites to obtain information on developing the dam sites for tourism.

### Results and Discussions

The findings and analyses in this chapter are the interpretations of results from Geographic Information System analysis and questionnaires obtained from combined results of those that visited Dadin-Kowa Dam only, Balanga Dam only and both dams. Out of the 130 questionnaires administered to respondents only one hundred and twenty four (124) were returned. Sixty one (61) respondents visited Dadin-Kowa dam only, thirty seven (37) respondents visited Balanga dam only, while twenty six (26) respondents visited both dams. The results were analyzed using one sample test and presented in tables.

Geographic Information System Analysis on Physical Setting of Dadin-Kowa and Balanga Dam Sites

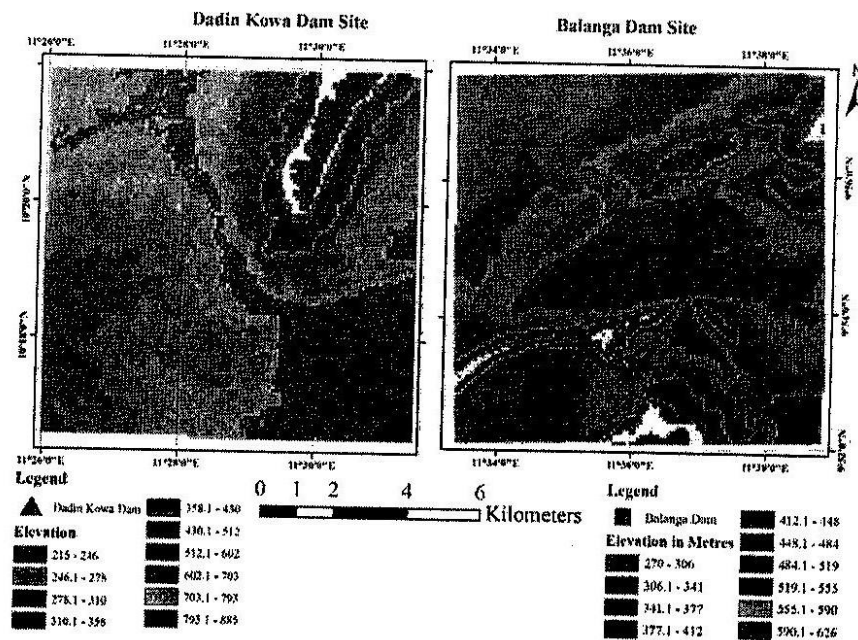


Figure 2: Relief of Dadin-Kowa and Balanga Dam sites  
Source: GIS analysis, 2018

Figure 2 shows the relief ranges at Dadin-Kowa and Balanga dam sites. In Dadin-Kowa Dam are the lowest elevation ranges between 215 to 246 meters found along the river Gongola channel downstream of the Dadin-Kowa Dam while the highest elevation is on the Bima Hills which range between 793 to 885 meters. The Bima Hill is a distinctive relief feature around the Dadin-Kowa Dam site.

Also in figure 2, the lowest elevation in Balanga Dam ranges between 270 to 306 meters while the highest elevation is between 590 to 626 meters. There are a number of hills surrounding the Balanga dam site. This site is also characterized by rough terrain.

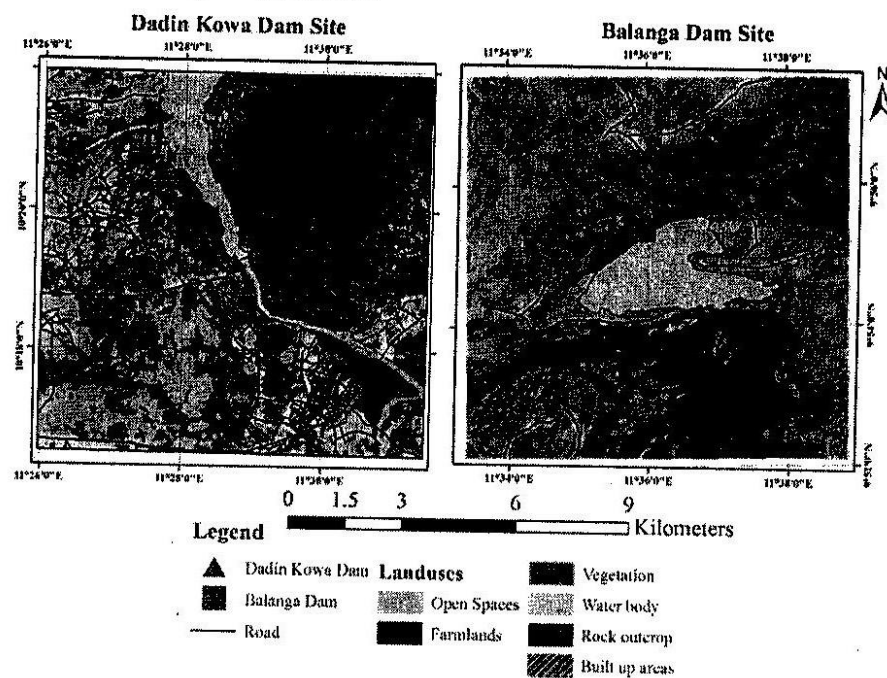


Figure 3 Landuse Distribution of Dadin-Kowa and Balanga Dam Sites  
Source: GIS analysis, 2018

Table 1: Landuse distribution of Dadin-Kowa and Balanga dam sites

Landuse	Dadin Kowa Dam Site		Balanga Dam Site	
	Area (km <sup>2</sup> )	%	Area(km <sup>2</sup> )	%
Built up	4.25	4.25	1.63	1.63
Farmlands	12.85	12.85	28.39	28.39
Open Spaces	21.48	21.48	19.61	19.61
Rock outcrop	21.28	21.28	18.19	18.19
Vegetation	32.90	32.90	26.23	26.23
Water body	7.24	7.24	5.96	5.96
	100.00	100.00	100.00	100.00

Source: GIS analysis, 2018

Figure 3 and Table 1 show the distribution of landuse classes between Balanga Dam and Dadin-Kowa Dam sites. Built-up areas form 4.25km<sup>2</sup> in Dadin-Kowa Dam site while in Balanga Dam site it form 1.63km<sup>2</sup>. In terms of open spaces, Dadin-Kowa Dam site has more with 21.48km<sup>2</sup> while Balanga dam site has 19.61km<sup>2</sup>. Farmlands, vegetation, rock outcrop and water body in that order in Dadin-Kowa dam site are 12.85km<sup>2</sup>, 32.90km<sup>2</sup>, 21.28km<sup>2</sup> and 7.24km<sup>2</sup> in Dadin-Kowa Dam site respectively, while in Balanga Dam site in the same order are 28.39km<sup>2</sup>, 26.23km<sup>2</sup>, 18.19km<sup>2</sup> and 5.96km<sup>2</sup> respectively. From the above findings, it is evident that farming activities forms one of the major uses of the Balanga dam even though the volume of the water is less than that of Dadin-Kowa Dam. Irrigation agriculture as observed from field survey confirmed that irrigation agriculture is the dominant practice of both dams.

Table 2: Scenery and landforms of Dadin-Kowa and Balanga dam sites

Landforms	Dadin Kowa Dam Site		Balanga Dam Site	
	area(km <sup>2</sup> )	%	area(km <sup>2</sup> )	%
Basin Flow	44.13	44.13	39.68	39.68
Lowlands	40.32	40.32	33.52	33.52
Plains	6.79	6.79	19.11	19.11
Uplands	4.26	4.26	5.69	5.69
Highplains	4.50	4.50	2.00	2.00
	100.00	100.00	100.00	100.00

Source: GIS analysis, 2018

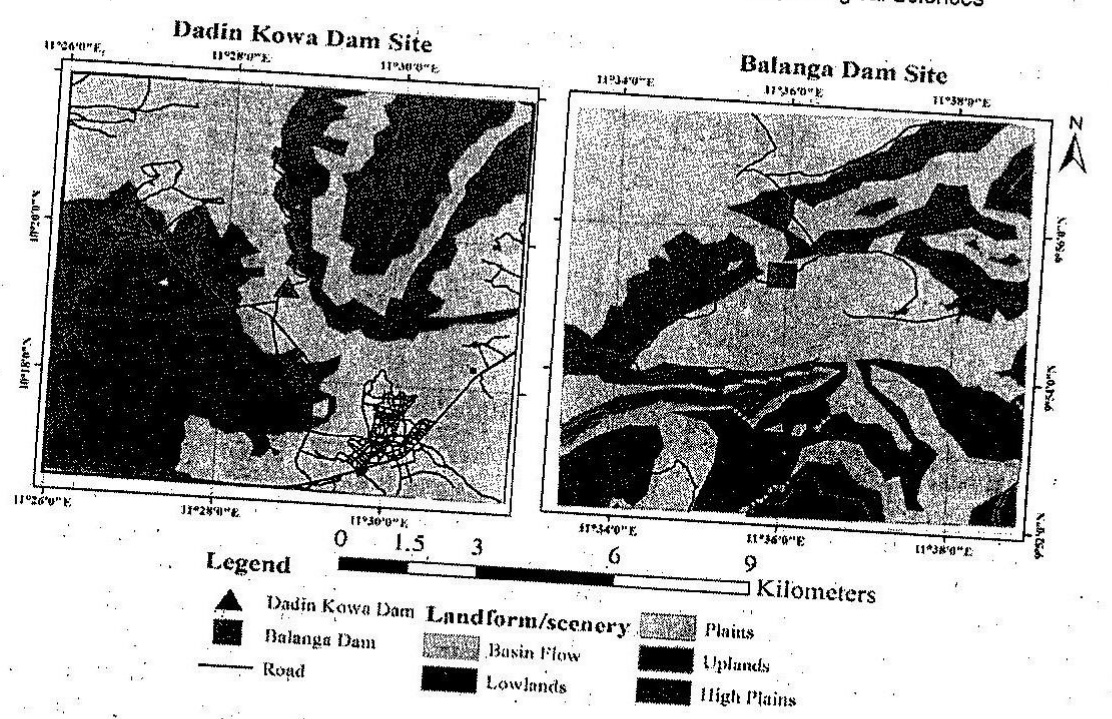


Figure 4: Scenery and Landform Distribution of Dadin-Kowa and Balanga dam sites  
Source: GIS analysis, 2018

Scenery as observed in figure 4 and table 2 has been categorized into 5 main classes based on their relief ranges and include basin flow, lowlands, plains, uplands and highlands. The basin flow constitutes 44.13% in Dadin-Kowa Dam site and 39.68% in Balanga Dam site. Lowlands, plains, uplands and highlands in Dadin-Kowa Dam site constitute 40.32%, 6.79%, 4.26% and 4.50% respectively while in Balanga Dam site lowlands, plains, uplands and highlands form 33.52%, 19.11%, 5.69% and 2.00% respectively.

From the above findings of landforms and scenery between the two dam sites, it is evident that variations exist between the two locations even though plains are more in Balanga Dam than in Dadin-Kowa Dam site.

Potential Uses of The Dam Sites For Tourism Development

Table 3: Potential Uses of the Dam Sites for tourism development

Potential Uses	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
TRANSPORT AS OTHER USE	23.077	113	.000	2.421	2.21	2.63
VIDEO SHOOT AS OTHER USE	21.838	113	.000	3.018	2.74	3.29
WILDLIFE AS OTHER USE	18.654	113	.000	2.675	2.39	2.96
RECREATION AS OTHER USE	36.674	113	.000	3.904	3.69	4.11
BUSINESS DISCUSSION	30.639	113	.000	3.184	2.98	3.39

Source: Field work, 2018

Following from table 3 above the two dams' potentials are ranked in the following order; Recreation ranks top of the potential uses of the dams with test value of 36.7. The two dams are naturally attractive places for tourism with beautiful sceneries, good for picnics and general relaxation. Holiday resorts, indoor and outdoor sports facilities, fine flowers, orchards and tree plantations can flow in conveniently around the dams. The fresh cool breeze around the dams offers good refreshing weather. The breathtaking landscape with hills and rocks (refer to figure 2 above) is good for hunting, mountaineering, cable cars and climbing. The water treatment plant in Dadin-Kowa is an added advantage to tourist as it offers interesting site too. The beauty of the landscape can further be enhanced with modern architectural designs and sculptures, other facilities that could be provided can include a multipurpose theater for conferences, exhibition of art works, zoos, crocodile ponds, pools, beautifully landscaped lawns that can be used for social gatherings such as weddings and parties including shopping centers, children playgrounds, health center and accommodations. The accommodations can be designed with such uniqueness that the visitors will have the feeling of being in touch with nature. Brick apartment, thatched roofing, cane chairs, wooden furniture, bed made with craft and terrazzo floor are some effects that can be put in place for tourism development at the two dam sites.

Subsequently, place for business discussion is ranked the second potential with test value of 30.6 which form part of the recreational need of conference halls for workshops and seminars. Transport ranks the third potential with test value of 23.1 involves navigation, yachting and canoeing across the water. Festivals like boat regatta could be done annually. Video shoot which is the fourth potential with test value of 21.8 can be used in generating income especially when a tourist center is fully established and in use. Lastly the wildlife park which ranks 18.7 which could harbor and conserve endangered species of different species of animals, also forms part of the tourism potentials.

Resources Available at the Dam Sites for Tourism Development

Table 4: Resources Available for Tourism Development

Resources Available	Test Value = 0					
	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
ROADS	27.229	120	.000	3.215	2.98	3.45
VAST LAND	63.585	120	.000	4.256	4.12	4.39
SCENERY	54.603	120	.000	4.083	3.93	4.23
WATER IN DAMS	72.776	120	.000	4.620	4.49	4.75
SECURITY	42.492	120	.000	3.529	3.36	3.69

Source: Fieldwork, 2018

Based on the test carried out, the water in the dams with test value of 72.2 is ranked highest of the resources available (see table 4) for tourism development. Dadin-Kowa dam has a reservoir capacity of 1.77x10<sup>9</sup>m<sup>3</sup> while Balanga dam has a reservoir capacity of 73x10<sup>6</sup>m<sup>3</sup> (refer to table 1 and figure 3 above). The water in the dams can be used for recreational activities like yachting, canoeing and fishing competition. It also serves as a potential for building ponds and introducing new species of fishes, aquaria, swimming pools and other sports. The water in the dams which freshens and cools the breeze around the dam, can also be used to water flowers and trees that could be planted around the dam sites to beautify the scenery and landscape.

The availability of vast land is ranked as the second potential resource available for tourism development ranked at 63.6 (see table 4). There is a large expanse of land at the two dam sites (refer to table 1 and figure 3) which could be used to design man-made features that could attract tourists to the dam sites (refer to table 1 and figure 3 above). These features include wildlife park- flora and fauna, amusement parks, art galleries, craft centers, gardens, health spa, museum, picnic grounds, leisure centers, accommodations, waterfront developments, sporting events and shopping malls.

The third is the scenery ranked with the value of 54.6 (see table 4). Both lands have beautiful sceneries with hills and valleys (refer to table 2 and figure 4 above), lush green vegetation of different trees and shrubs (refer to table 1 and figure 3), interesting view of the rockfilled embankments, spillway, power house, irrigation gates and canals, these all are great resources that will decorate and enhance tourism around Dadin-Kowa and Balanga Dams.

Security of the two dam sites is ranked fourth with the value of 42.5 (see table 4). The areas where these dams are located are very peaceful with little or no form of crisis, natural disasters or outbreak of diseases. Therefore, such calm is a great potential that Dadin-Kowa and Balanga Dams sites have for tourism development.

Road networks leading to the dam sites are not so motorable and scored 27.2 (see table 4) though they are available.

#### Constraints Delimiting the Development of the Dam Sites for Tourism

**Table 5: Constraints Delimiting Development of the Dam Sites for Tourism**

Constraints	Test Value = 0			95% Confidence Interval of the Difference	
	T	Df	Sig. (2-tailed)	Mean Difference	
				Lower	Upper
INSECURITY	26.952	118	.000	3.252	3.01 3.49
INSUFFICIENCY OF FUNDS	49.219	118	.000	3.983	3.82 4.14
LACK OF AWARENESS	37.435	118	.000	3.924	3.72 4.13
INACCESSIBILITY	21.355	118	.000	2.756	2.50 3.01
LIMITED SPACE	17.292	118	.000	2.076	1.84 2.31

Source: Field work, 2018

Table 5 reveals that lack of funds valued at 49.2 is the main reason inhibiting the development of the dam sites for tourism industry. Contrary to the governments' goodwill to undertake this project, it lacks the adequate funds that will sponsor such act.

Secondly, lack of awareness valued at 37.4 is a serious handicap for the development of the dam sites for tourism. The study revealed that most respondents are not aware of the financial benefits that will accrue from tourism industry in the state, neither are they aware of benefits that include leisure, recreation, researches, transportation and modern fishing.

In considering constraints challenging tourism development, inaccessibility is ranked third with a value of 21.4. The two dam sites have network of roads which however have not been improved on which render the roads immotorable in some part.

Insecurity ranked the fourth with a value of 27. This constraint to development of the dam sites for tourism is to be looked at cautiously due to the fact that while the localities around the dam sites are calm, the north-eastern part of the country recently experienced unrest.

Lastly, limited space with the test value 17.3 was identified as a constraint. It is the least of the factors militating against dam site development for tourism. The analysis reveals therefore that space for expansion and tourism development is available to a large extent (refer to figure 3 and table 1).

#### Conclusion and Recommendations

The study mapped out physical settings, identified potential uses of the dams (recreation, a place for business discussion, wildlife park, video shoot and transport) including resources available for sustainable tourism development (water in the dams, vast lands, sceneries, security and roads) and the constraints delimiting the development of Dadin-Kowa and Balanga Dam sites for tourism development (insufficiency of funds, lack of awareness, insecurity, inaccessibility and limited space). The research revealed that both dams have great potentials for tourism development in the state. In light of the above findings, the following recommendations were made;

Reasonable effort should be put in place by stakeholders to do things that will arouse and attract the interest of tourists to the dam sites for leisure and recreation.

Government urgently needs to address the issue of security by putting up measures that will combat crime and all forms of vices that will hinder the growth of tourism.

Necessary infrastructure that will promote the growth of tourism industry should be put in place such as recreational facilities/attraction, supply of clean water, good hospitality centers, good communication networks and access to the internet.

Ensuring improved water in the reservoir, afforestation, decrease in farmland cultivation around the dams and securing open spaces for sustainable tourism development by the government and other related agencies.

Considering the availability of funds, execution and monitoring of the development of the dam sites for tourism, it is suggested that government first develops Dadin-Kowa Dam site before going on to Balanga Dam site.

#### Reference

- Adang K.L, Nsor C.A and Tela M. (2015). Checklist of bird species at the Dadin-Kowa Dam, Gombe State, Nigeria. *Global advanced journal of Agricultural Science (ISSN:2315-5094) vol. 4(6) pp.270-274, June 2015.*
- Ajibade A., Ayodele I.A, Ojos O. and Adetotor A.O (2013). Wildlife based tourism activities and income generation in Kainji Lake National Park, Nigeria. Published by African journal of Agricultural Research, Vol.8 (49), pp. 6435-6438, <http://www.academicjournals.org/AJAR>
- Atuk, J.J (2009). An Assessment of Tourism Potentials in Kaduna State, Nigeria. Unpublished M.sc thesis submitted to the Department of Urban and Regional Planning, Ahmadu Bello University Zaria, Kaduna State
- Ayeni, D.A and Ebohon O.J (2012). Exploring Sustainable Tourism in Nigeria for Developmental Growth, *European Scientific Journal vol 8, No 20.* Published by European Scientific Institute. Gombe State Committee on Agriculture (a report) June, 2011
- Ibrahim, B. (2014). Socio-economic effects of the Balanga dam, Balanga L.G.A, Gombe State. Unpublished B.sc project submitted to the Department of Geography, Gombe State University, Gombe, Gombe State

- Kachalla, Y. (2012). Present use and Potentials of Kanawa Savanna woodland (forest reserve) in Yamaltu-Deba L.G.A Gombe State (unpublished) B.sc project submitted to the Department of Geography, Gombe State University
- Natural Resource Baseline Survey Gombe State 2008
- Njike C., Susan N. and Daniel O. (2013). Harnessing the tourism potentials of Abia State using Advanced Geospatial system techniques- A Review, TS04D-GIS Tools and Techniques- 6554  
FIG Working Week 2013, Environment for Sustainability, Abuja, Nigeria. May 2013
- UNWTO (2015). Making Tourism more sustainable – A guide for policy makers
- Williams, L.A (2017). Paper work on the synoptic profile of Balanga dam and Irrigation Scheme. Ministry of Water Resources/Directorate of Water Resources Gombe State