

# Progress on the Hydropower Component of Kashimbilla Multipurpose Dam Project, Nigeria

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# Outline

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# ABSTRACT

Kashimbilla multipurpose dam was proposed principally to check threat of flood from the structurally weak volcanic Lake Nyos, located upstream along the Cameroon line of volcanic activity to generate 40MW of Hydro electric power. Other benefits of the project include; Ecological Flood Control; Water Supply to 400,000 people. The project is to generate 40MW of hydropower; Irrigation (2000ha); Fisheries; Airstrip; Tourism; Poverty Alleviation and job creation etc. On a broader scale, the project is to address global changes as well as shared concept of integrated water resources management requirements.

The Kashimbilla/Gamovo Multipurpose Buffer Dam is on River Katsina-Ala in Takum Local Government Area of Taraba State, Nigeria. The project would mitigate against the environmental disaster that would occur in several states of Taraba, Benue, Cross River, Kogi and Delta and affecting more than 6 million people. The dam is 95% completed and the hydropower component is 80% completed to date. The power component comprises Hydropower Generation (40MW capacity), Generators (4×12,100KVA), Turbines (4×10MW), Turbine Type (Kaplan), Transformer (8×15MVA).

## **ABSTRACT Cont'd ...**

The Power Evacuation Component includes: The erection of Kashimbilla – Takum (132kV Double Circuit Line – 65km), Takum – Wukari (132kV Double Circuit Line – 75km), 132kV Switchyard at Kashimbilla, 2×7.5MVA 33/11kV Substations at Donga and Rafin Kada with associated distribution network facilities, 2×7.5MVA 33kV Substation at Kashimbilla Switchyard and 33kV distribution network to Kashimbilla town and Township Distribution Network (TDN)].

The dam area is in a rich agricultural area, and envisaged that the evacuation of the power generated from the 40MW power plant will go a long way to facilitate the realization of agricultural value chain development in places such as Kashimbilla, Takum, Donga, etc in Taraba State and environs, with extension to Benue, Adamawa, and Plateau States. The completion of this project will also add to power improvement nationwide as well as address global challenges in the area. The purpose of this paper is to state the progress made in this multipurpose project, particularly the hydropower component.

# INTRODUCTION

- Kashimbilla Multipurpose Buffer Dam Project is located between the towns of Kashimbilla and Gamovo on River Katsina-Ala in Takum Local Government Area of Taraba State, North East Nigeria.
- The dam is principally intended to check the threat of flood from the structurally weak volcanic Lake Nyos, located in the high Bamenda Plateau (300m above sea level) upstream along the Cameroun line of volcanic activity . This disaster, if allowed to occur, will affect the States of Taraba, Benue, Cross River, Kogi and Delta.

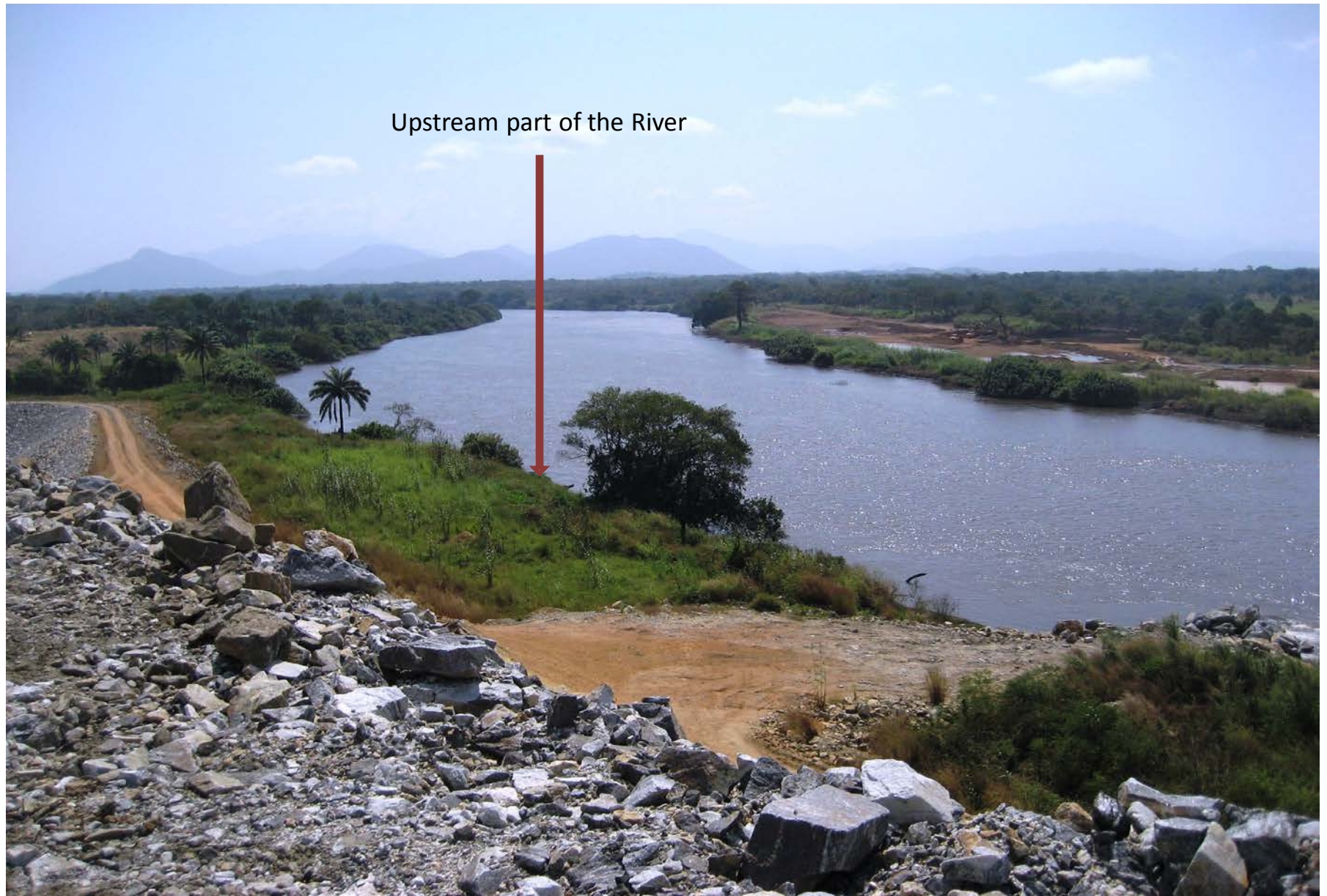
# PROJECT LOCATION



Map No. 4228 UNITED NATIONS  
October 2004

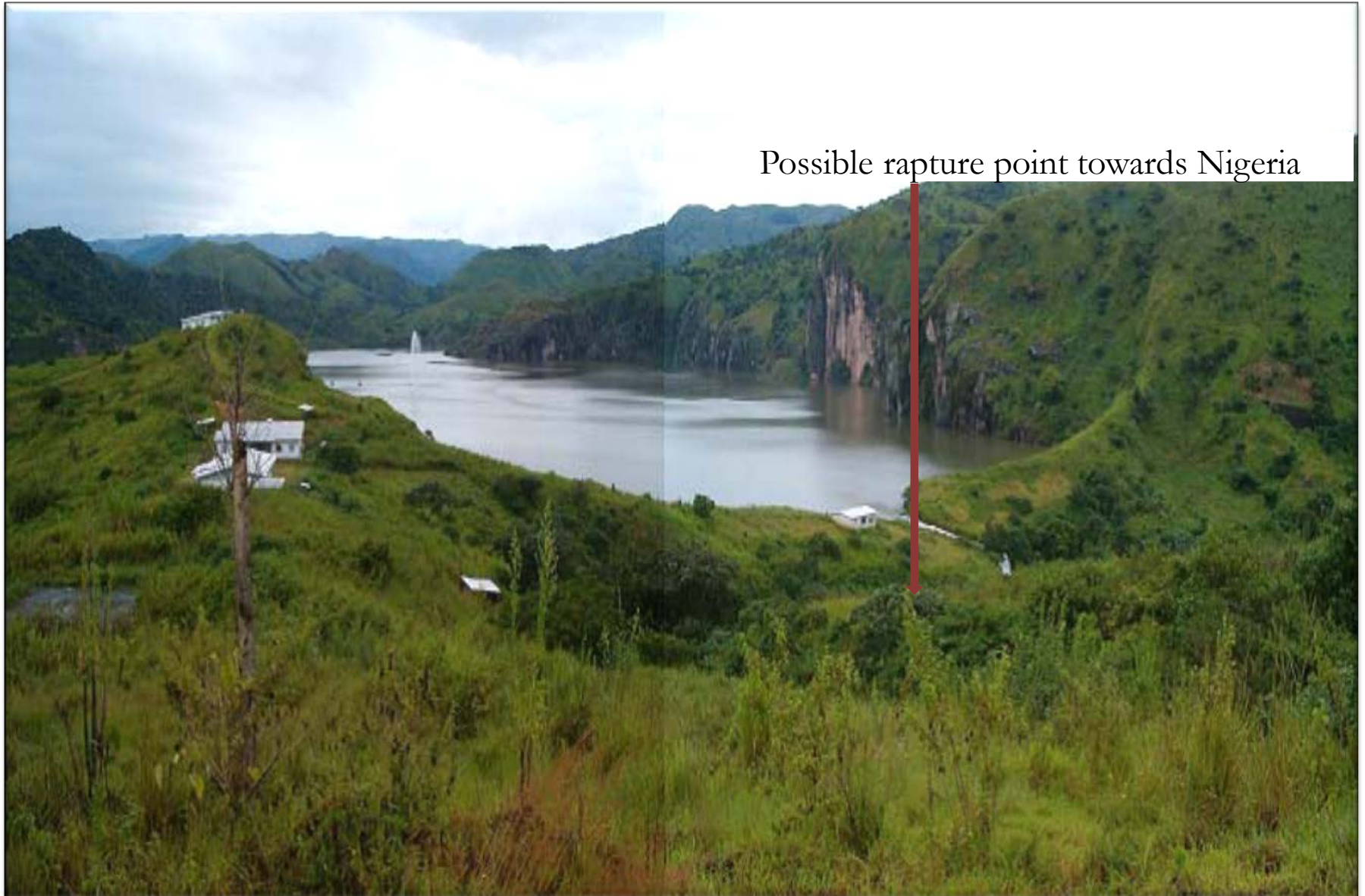
Department of Peacekeeping Operations  
Cartographic Section

Fig.1: Kashimbilla Multipurpose Dam Site Location



Upstream part of the River

Fig. 2: PROJECT LOCATION cont'd – Katsina-Ala River



Possible rapture point towards Nigeria

Fig. 3: LAKE NYOS - Panoramic view.



# Lake Nyos Data

Basin Country:	Cameroun
Max. Length:	2.0km
Max. Width:	1.2km
Surface Area:	1.58km <sup>2</sup>
Average Depth:	208m

# SHARED CONCEPT OF MULTIPURPOSE DAM PROJECTS

- The SHARE concept for multipurpose water uses of hydropower reservoirs is applied in the Kashim Billa dam. This has an overarching principle that will make the reservoir more sustainable and equitable. The reservoirs rely on the following principles:-
  - Shared vision
  - Shared resources
  - Shared rights and risks
  - Shared Costs and benefits

# SHARED CONCEPT OF MULTIPURPOSE DAM PROJECTS

Some similar projects with multipurpose water uses of hydropower reservoirs include:

- Three Gorges project in China, Asia
- Kandadji dam in Niger, Africa
- Villerest dam in Paris, France
- Tannesse Valley Authority, USA, North America.

# Lake Nyos Threat to Nigeria

The event which has characterized this lake and has given it a worldwide fame is the limnic eruption of August 1986. In this process a large bubble of gas trapped at the bottom of the lake gets released. It reaches the top, explodes outwards and then travels down the slopes suffocating everything in its path. It is usually associated with no smoke, no fire, no ash, no lava and no heat.

About 18 million cubic meters of carbon dioxide (CO<sub>2</sub>) gas was released all at once from Lake Nyos in this eruption. This has little or no effect on Nigeria, because the gas released is heavier than air and therefore hugged the ground as it moves, except when the orographic condition permits. Even in that case, the gas would have been substantially dispersed before it crosses the Cameroun-Nigeria border.

The major threat to Nigeria is in the highly unstable upper part of the lake body, which holds about 50 million cubic meters of water.



Fig. 4: De-Gasing of Lake Nyos Panoramic view.

# ECOLOGICAL IMPLICATION

The eruption of the Lake which took place on **August 21, 1986**, in Cameroun, released thousands of tonnes of poisonous gas (carbon dioxide) and, caused extensive flooding resulting in the death of 1,700 people, 3,000 herds of cattle and other livestock.



**Fig. 5: ECOLOGICAL IMPLICATION cont'd - A threat to Human & Animal life**

# BENEFITS OF THE HYDROPOWER DAM

The water resources potential of the area is enormous and its natural structural configuration is favourable for multipurpose development such as:

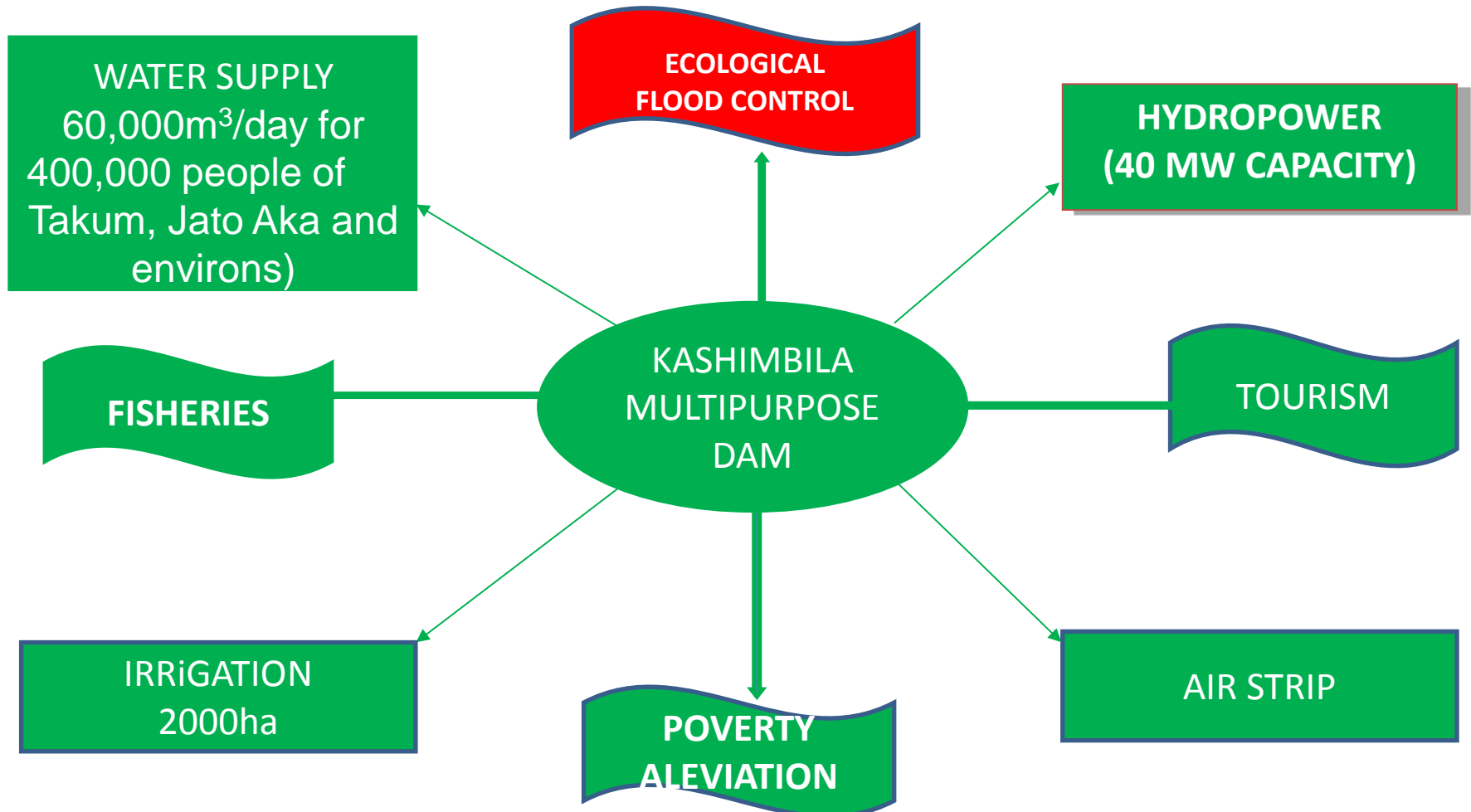


Fig. 6: Multipurpose Status Display of Kashimbilla Dam

## **BENEFITS OF THE HYDROPOWER DAM**

- Hydropower reservoirs are at the heart of the water-energy-food nexus. The production and use of energy and the storage and use of water for irrigation are vital to the economy, health and welfare of all nations. This multipurpose use concept is evidently captured in the Kashimbilla Project.
- It is important to move away from ad hoc or laissez-faire planning and management towards long-term integrated processes in which water, energy and food resources are recognized as being interconnected.



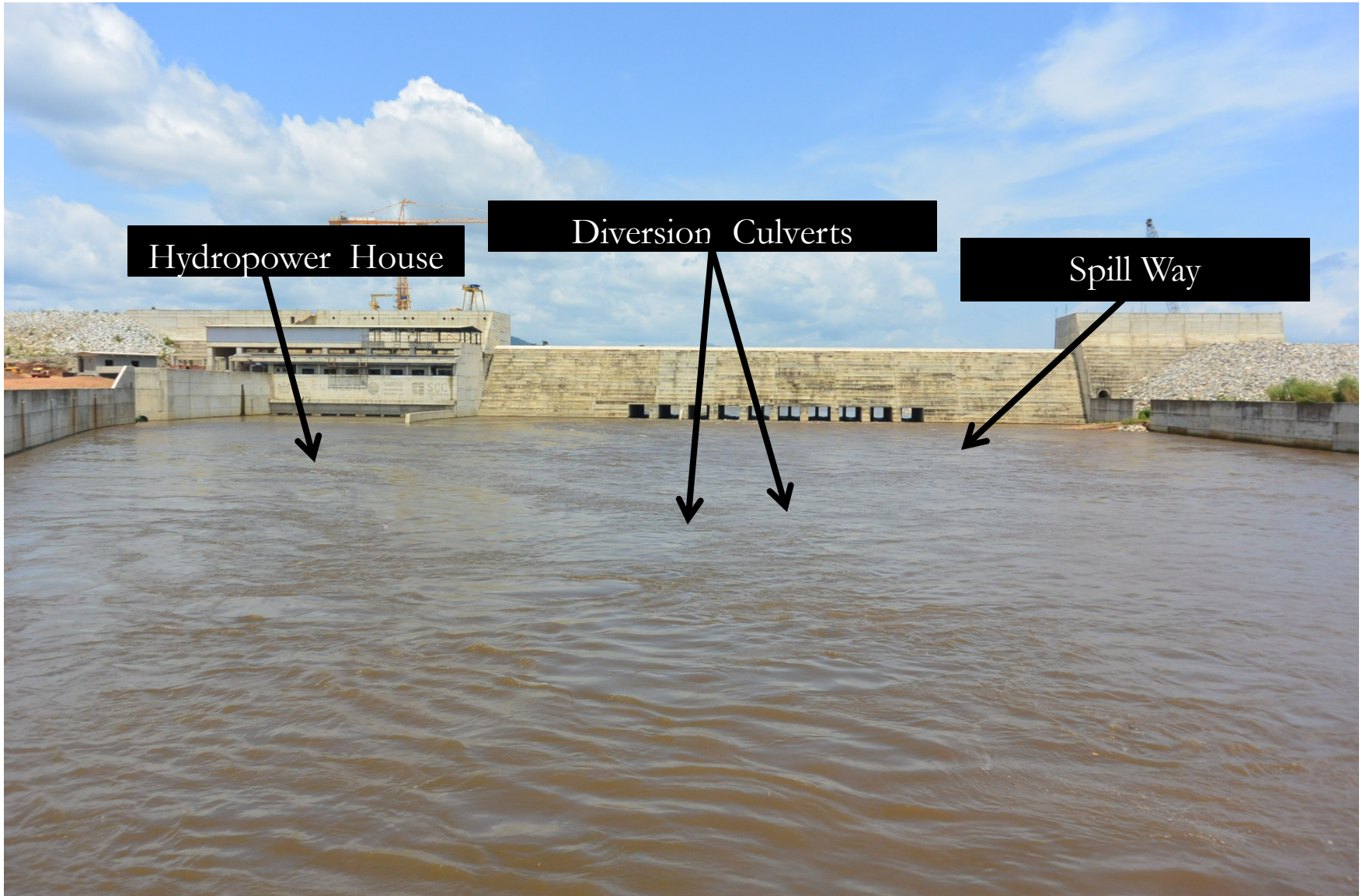
# SCOPE OF WORK AND TECHNICAL SPECIFICATION

To date, remarkable progress has been achieved in all the various components of the project, with overall percentage completion of about 95% of the civil engineering works of the actual dam construction. The works include:

- Access Road
- Staff Housing Unit
- Construction of the Dam
- Pipeline for Water Conveyance to Takum and Jato Aka towns and environs
- Hydropower (to generate 40 MW Capacity)
- Air Strip
- Water Treatment Plant

## SCOPE OF WORK AND TECHNICAL SPECIFICATION cont'd

- Dam height 35m
- Dam length 1,585m
- Dam Width 150m
- Reservoir Capacity 500MCM
- Dam Level 200m asl
- Full Supply Level 192m asl
- Minimum Operational Level 184.30m asl
- Tail Water Level 159.82m asl
- Irrigation Area 2000ha
- Water Treatment Plant: 60,000 m<sup>3</sup>/ Day
- Water Supply 400,000 people
- Access Road 1km
- Air Strip 2.5km



**Fig. 7: Aerial View of Kashimbilla Dam**



**Fig. 8: View of Kashimbilla Dam Intake**



Fig. 9: Kashimbilla Dam Gallery



**Fig. 10: PROGRESS OF WORK cont'd – Air Strip**

# HYDROPOWER COMPONENTS

- Hydropower Generation - 40MW Capacity
- Turbine Level - 165.5m asl
- Generators - 4 x 12,100KVA
- Turbines - 4 x 10MW
- Turbine Type - Kaplan
- Transformers - 8 x 15MVA



**GENERATOR FLOOR**



**VIEW OF THE GENERATORS IN POSITON**



**INSTALLATION OF THE SHAFT**



**VIEW OF THE HP STATION**

**Fig. 11: CONSTRUCTION WORKS AT THE HYDROPOWER STATION**

**Work Progress as at January 2015**





**Fig. 12: The Installed 4 Nos. Generators for 40MW hydropower to be generated**



Fig. 13: Installed 25 and 15 tons Cranes

# POWER EVACUATION COMPONENTS

Scope of work for the power evacuation components of the Kashimbilla project are as listed below:

## Substation

- 132kV Switchyard at Kashimbilla
- 2X60MVA 132/33kV substation at Takum
- 2x60MVA 132/33kV substation at Wukari
- 2x7.5MVA 33/11kV at Rafin Kada
- 2x7.5MVA 33/11kV at Donga

# POWER EVACUATION COMPONENTS Cont'd...

## 132 kV Transmission Line

- 65Km, 132kV double circuit line from Kashimbilla to Takum
- 75Km, 132kV double circuit line from Takum to Wukkari
- 105Km, 132kV double circuit from Wukari to Yandev
- 2X132kV line bays extension at Yandev

## 33 & 11kV INTER TOWNSHIP CONNECTION (ITC) AND TOWNSHIP DISTRIBUTION NETWORK (TDN)

- 40km, 2x33kV double circuit on steel poles from Wukari-Donga-Rafin Kada;
- Electrification of Communities around the dam site
  - ✓ Kashimbilla
  - ✓ Birama
  - ✓ Lanke
  - ✓ Malumshi e.t.c

# Challenges

This include marketability, funding, implementation, strategy and lack of adequate capacity.

## Marketability

- Absence of hydropower resource assessment tool for the country for hydropower prospecting and feasibility analysis
- Limited hydropower studies of key locations with potentials
- Complexities due to lack of proper definition of stakeholders' roles in the industry
- Lack of requisite knowledge by investors on licensing and registration in Nigeria

# Challenges Cont'd...

## Funding

- Absence of dedicated fund by the banking sector for hydropower development
- Over dependence on public budgetary funding for implementation
- Lack of information on other funding options

## Implementation Strategy

- Absence of targets and milestones to encourage the pace of deployment in the sector
- Implementation predicated on technical viability alone without financial viability considerations

## Challenges Cont'd ...

### Lack of Adequate Capacity

- Limited access to ever evolving Energy Technology which has expanded to include plug-and-play models
- Lack of adequate expertise.



# CONCLUSION

- The recent global trend of seismic activities has shown that no part of the world, including Nigeria, is immune to potentially catastrophic events. In the case of Nigeria, these events may arise from possible threats of ecological disaster of volcanic eruptions from Lake Nyos. Therefore, the need to accelerate the pace of work on this project is imperative.
- The completion of this dam and the power evacuation will have additional benefit of increasing the national power generation by 40MW.
- It is however envisaged that, with continued support and adequate funding from Government, the project would be completed on time and this imminent disaster averted.
- The project is expected to be completed in the last quarter of 2015

# REFERENCES

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Thank you