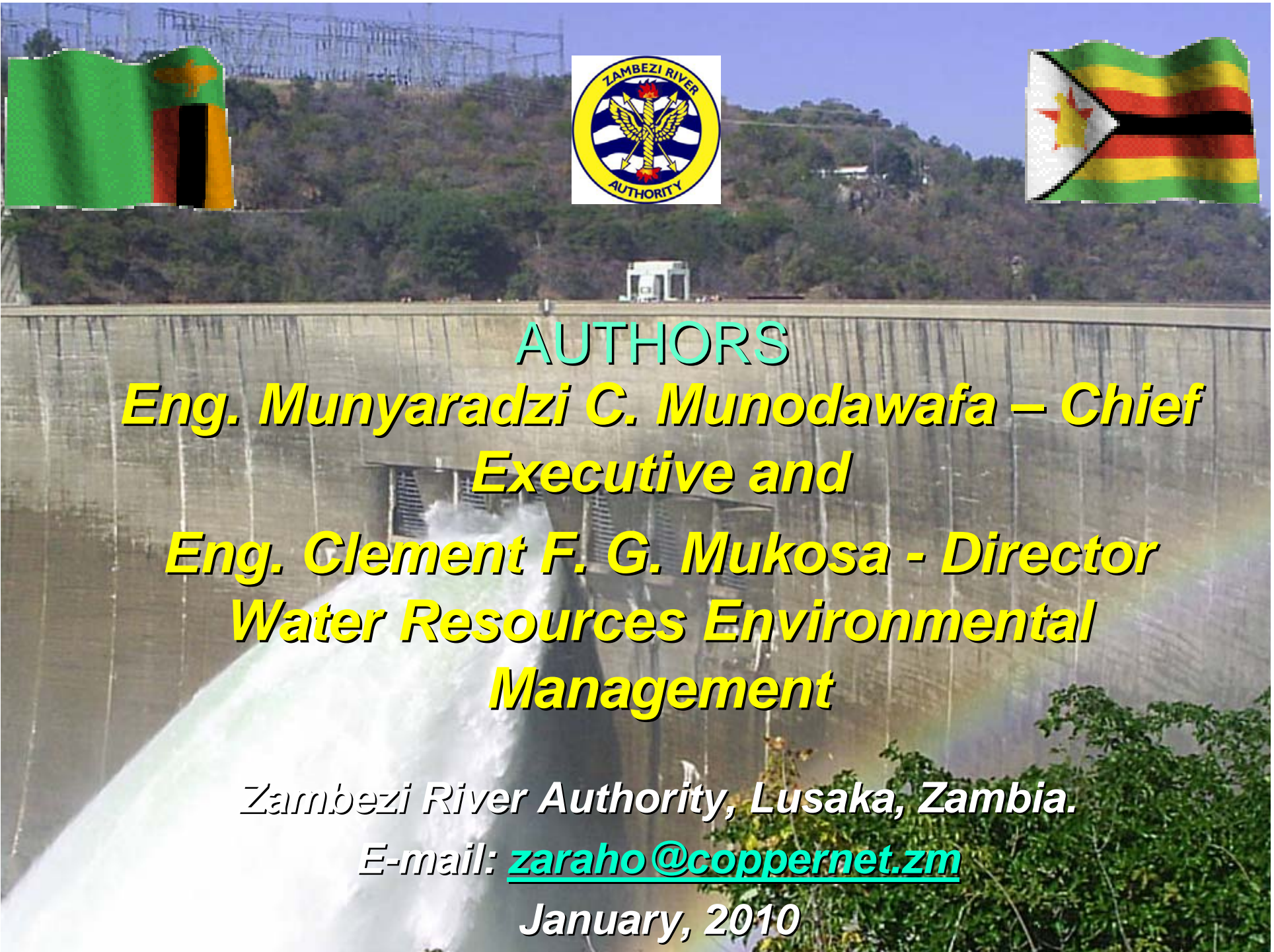




ADAPTING TO THE CONSEQUENCES OF CLIMATE CHANGE IN THE ZAMBEZI RIVER BASIN: ZAMBEZI RIVER AUTHORITY CASE STUDY.

**8TH WORLD ASSEMBLY OF THE INTERNATIONAL
NETWORK OF BASIN ORGANISATIONS – DAKAR
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OUTLINE

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2. EFFECT OF LOW FLOWS ON HYDRO-ELECTRIC POTENTIAL OF THE ZAMBEZI
3. FINANCIAL ARRANGEMENTS BEFORE THE INTRODUCTION OF TARIFFS
4. THE INTRODUCTION OF TARIFFS AND FEES
5. FORMULATION OF THE WATER TARIFFS
6. CONCLUSION

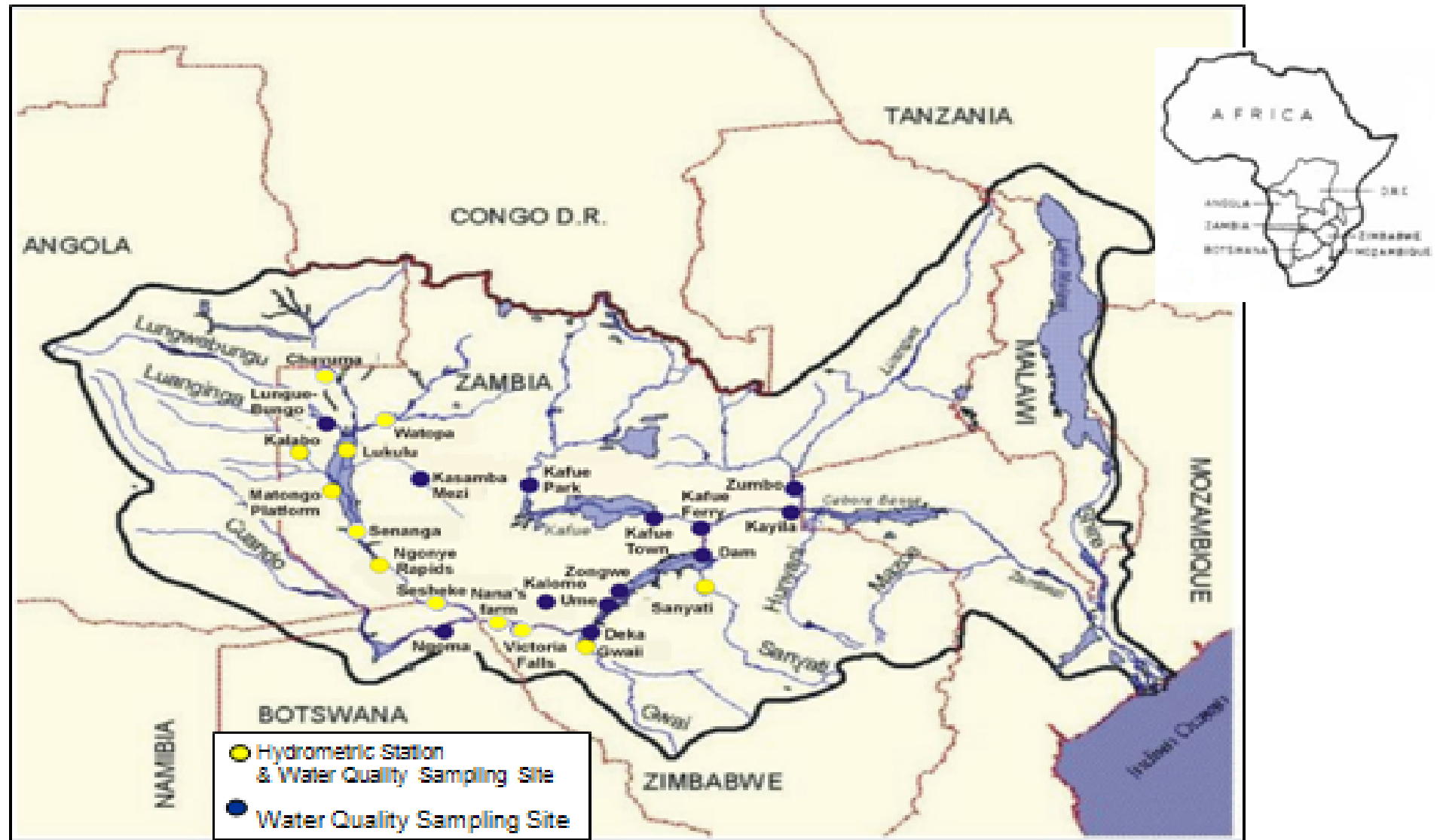
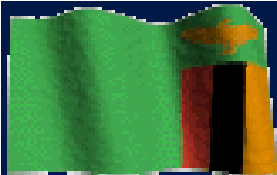
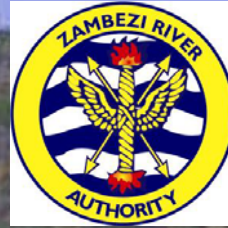


Figure 1: The Zambezi River

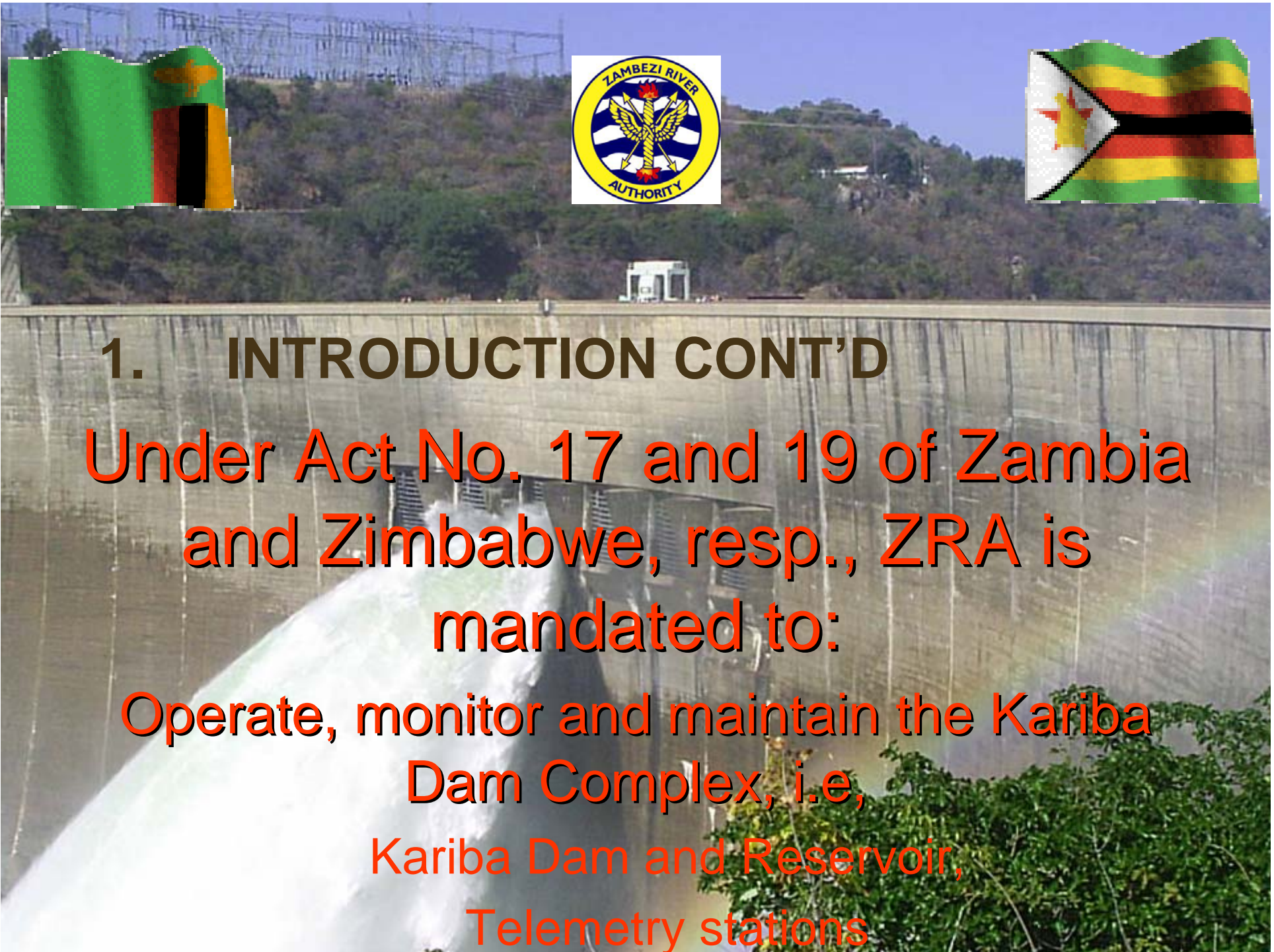


1. INTRODUCTION

ZRA established as a body corporate on 1st October, 1987

Through Parallel legislation in parliaments of Zambia and Zimbabwe (Acts No. 17 and 19 of 1987, respectively)

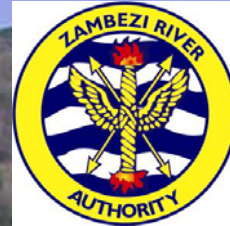
ZRA replaced Central African Power Corporation (CAPCO)



1. INTRODUCTION CONT'D

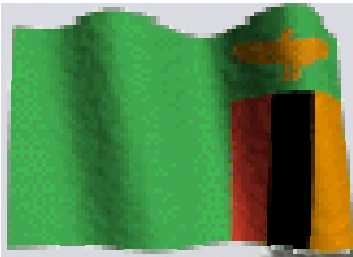
Under Act No. 17 and 19 of Zambia and Zimbabwe, resp., ZRA is mandated to:

Operate, monitor and maintain the Kariba Dam Complex, i.e,
Kariba Dam and Reservoir,
Telemetry stations



1. INTRODUCTION CONT'D

- The Kariba Dam Complex was primarily built for hydro-electric generation and houses two power stations, one on the North Bank (720MW) under the Management of ZESCO in Zambia and the other on the South Bank (750 MW) under the management of Zimbabwe Power Company (ZPC) in Zimbabwe.
- For power generation however, the two utilities share the water available on a 50/50 basis.



2. EFFECT OF LOW FLOWS ON HYDRO-ELECTRIC POTENTIAL OF THE ZAMBEZI

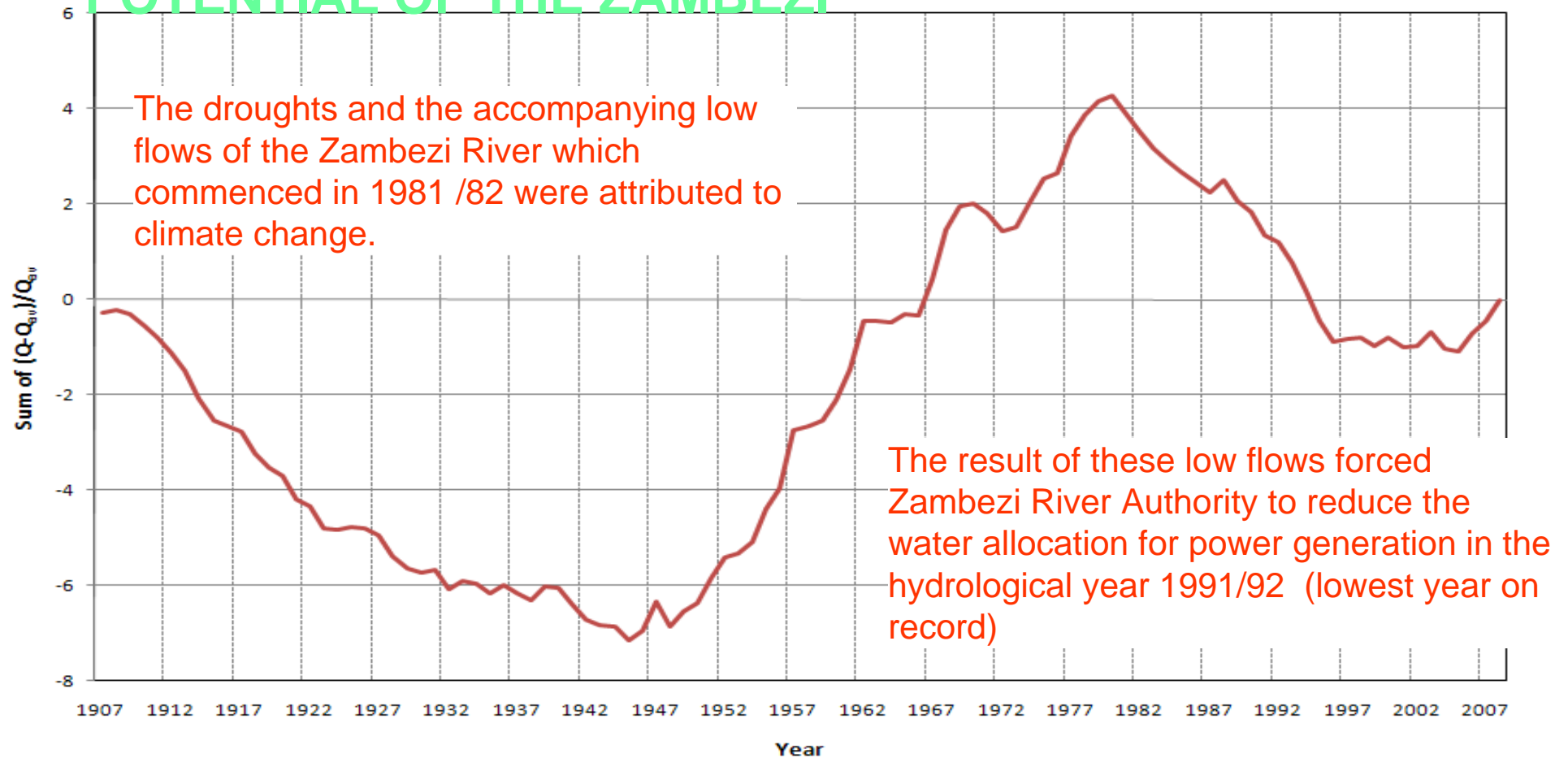


Figure 2: DIMENSIONLESS DIFFERENTIAL MASS CURVE: Zambezi River at Victoria Falls

1907/08 - 2008/09

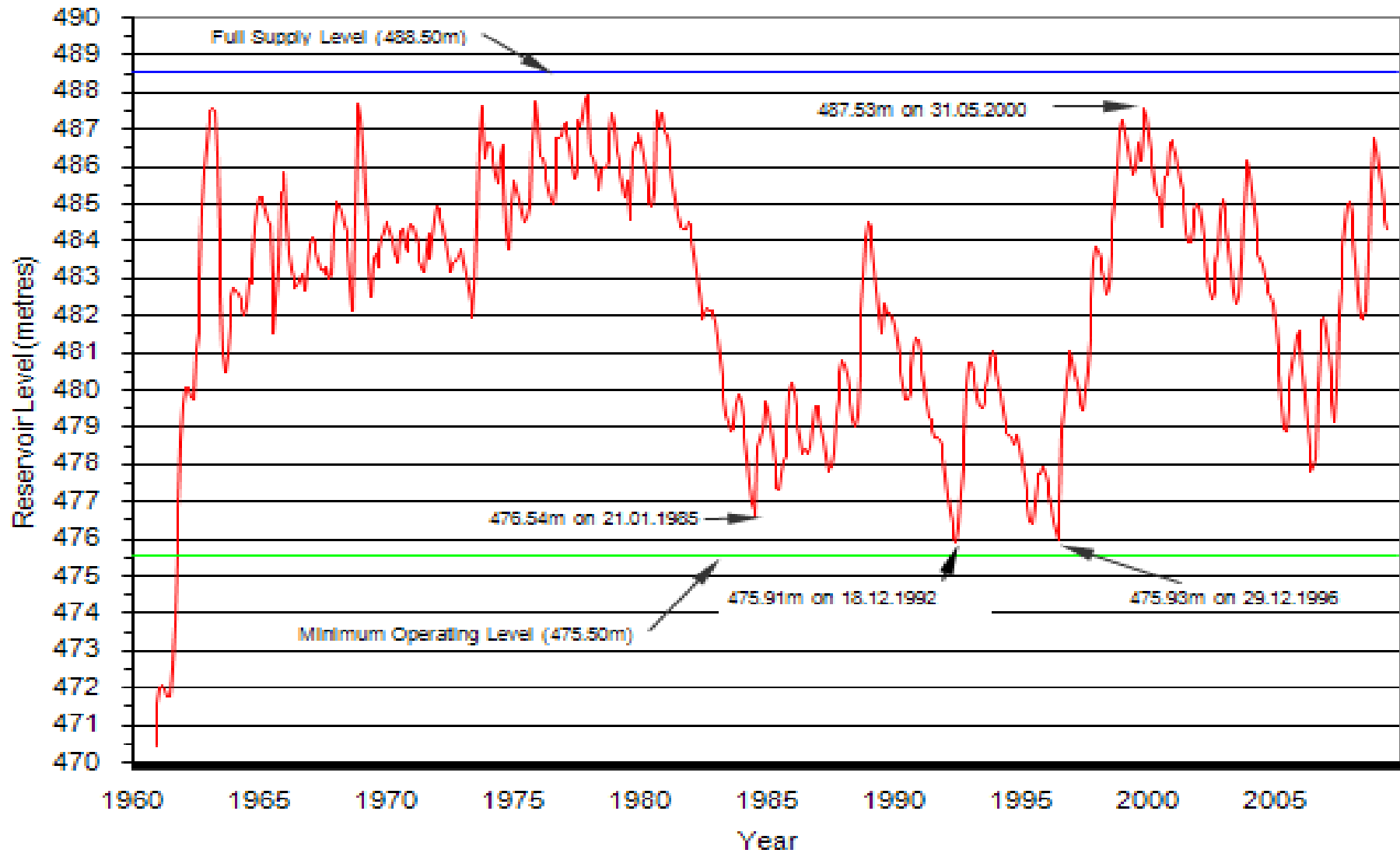


Figure 3: KARIBA RESERVOIR Recorded End-of-Month Levels; May 1961 to December 2009

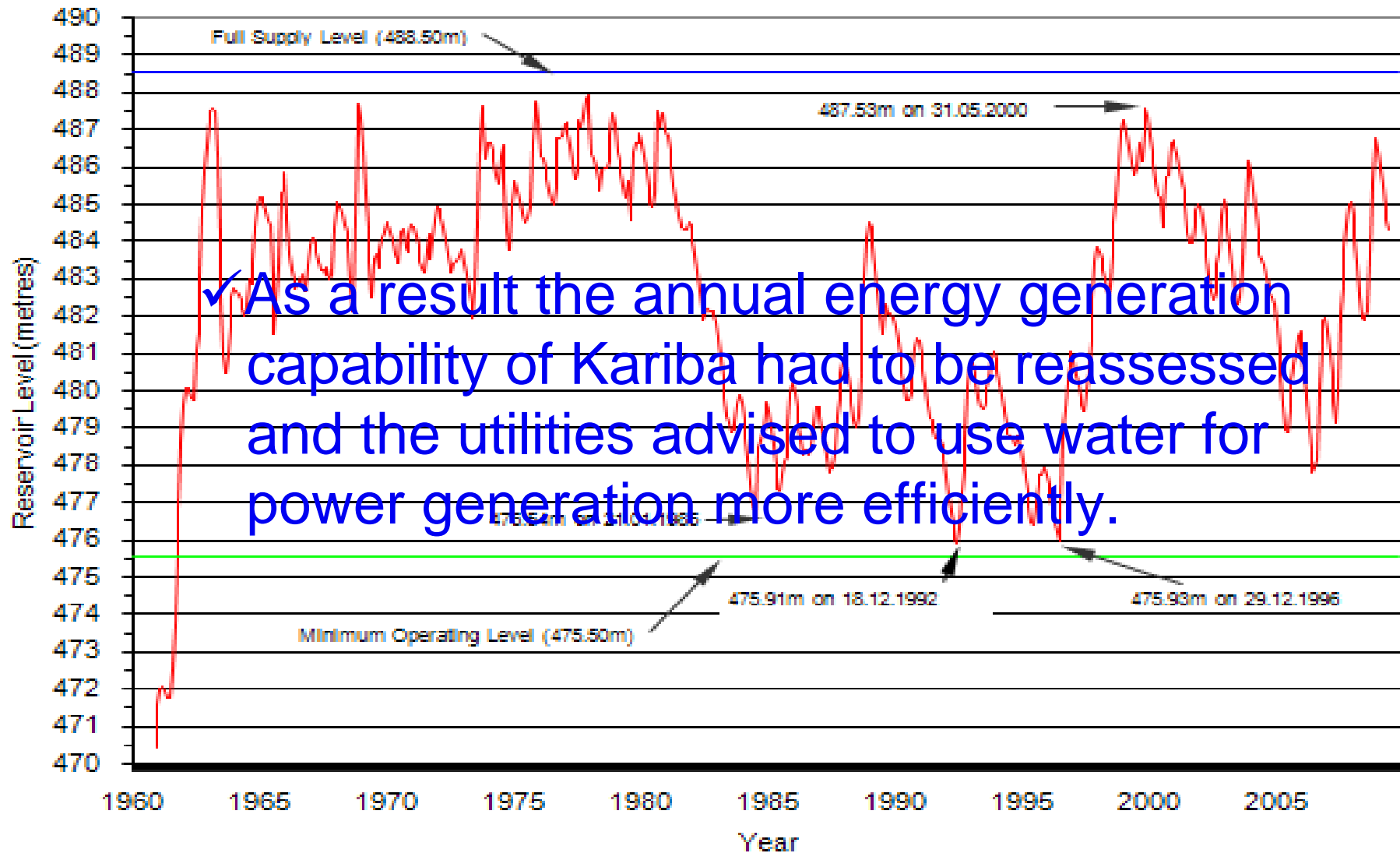
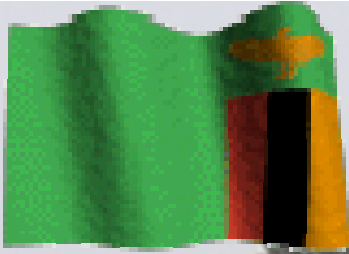
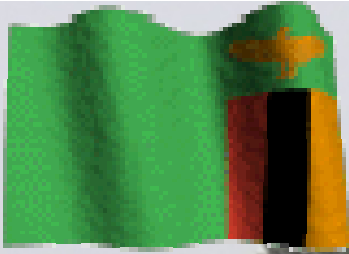


Figure 3: KARIBA RESERVOIR Recorded End-of-Month Levels; May 1961 to December 2009



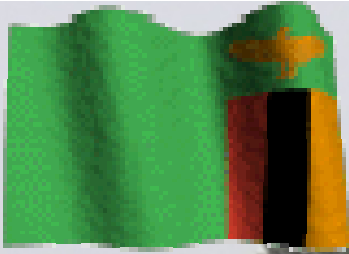
3. FINANCIAL ARRANGEMENTS BEFORE THE INTRODUCTION OF TARIFFS

- All CAPCO costs and financial requirements were met and shared equally between the two countries.
- All ZRA costs and financial requirements were met and shared efficiently between the two countries on reimbursement basis.”



4. THE INTRODUCTION OF TARIFFS AND FEES

- While the reimbursement of ZRA costs by the two utilities operated reasonably satisfactorily, problems had sometimes been encountered of delays in reimbursement or of curtailment of funds, resulting in functions for which budget provision had been made not being carried out.
- From an economic view point, the lack of a tariff structure coupled with no restriction on generation led to inefficient use of the water which resulted in severe problems in 1991/92 and the consequent shortages of electricity imposing considerable economic costs.



4. THE INTRODUCTION OF TARIFFS AND FEES CONT'D

➤ With the introduction of water tariffs in January 2000, the Authority is now allocating an equal amount of water to each utility instead of energy.

➤ The responsibility for efficient water utilization, therefore now lies with the utilities as water is now a cost component.



5. FORMULATION OF THE WATER TARIFFS

➤ In order to understand the proposed water tariff mechanism, it is important to capture the fact that ZRA endeavored to raise enough revenue to meet its financial obligations in a given year.



5. FORMULATION OF THE WATER TARIFFS CONT'D

The following equation gives the revenue raising model for the Authority:

$$Y = aX + b$$

Where: **Y**, is the annual revenue in US\$

a, is the water tariff in US\$/m³

X, is the total annual volume of water used for power generation in m³

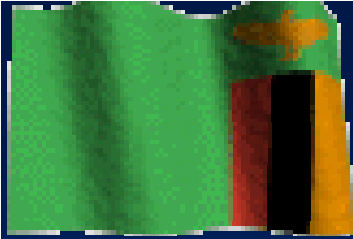
b, is the fixed annual charge in US\$



5. FORMULATION OF THE WATER TARIFFS CONT'D

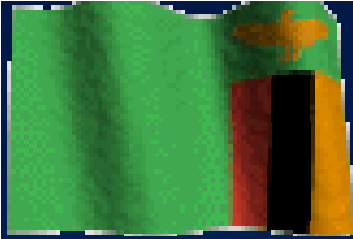
$$Y = aX + b$$

When $X = 0$, ideally no water will have passed through our water metering installations. Thus, the revenue collectable from the utilities is merely the recurrent budget component, b .



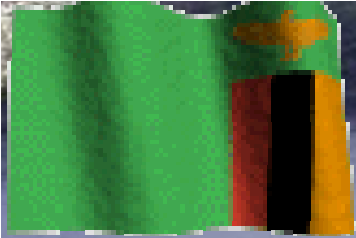
6. CONCLUSION

- The tariff has provided an incentive structure for the utilities to use Kariba waters more efficiently.
- Zambezi River Authority has achieved financial autonomy since the introduction of a tariff which is adjusted every year to meet the costs of ZRA and cater for inflation.



6. CONCLUSION CONT'D

- In order to redress historical injustices associated with the building of Kariba Dam, a Development Fund has been established by Zambezi River Authority.
- Due to the variability of weather and the hydro-cycle in the basin, the need for more efficient water management and river regulation has become extremely important



Thank You