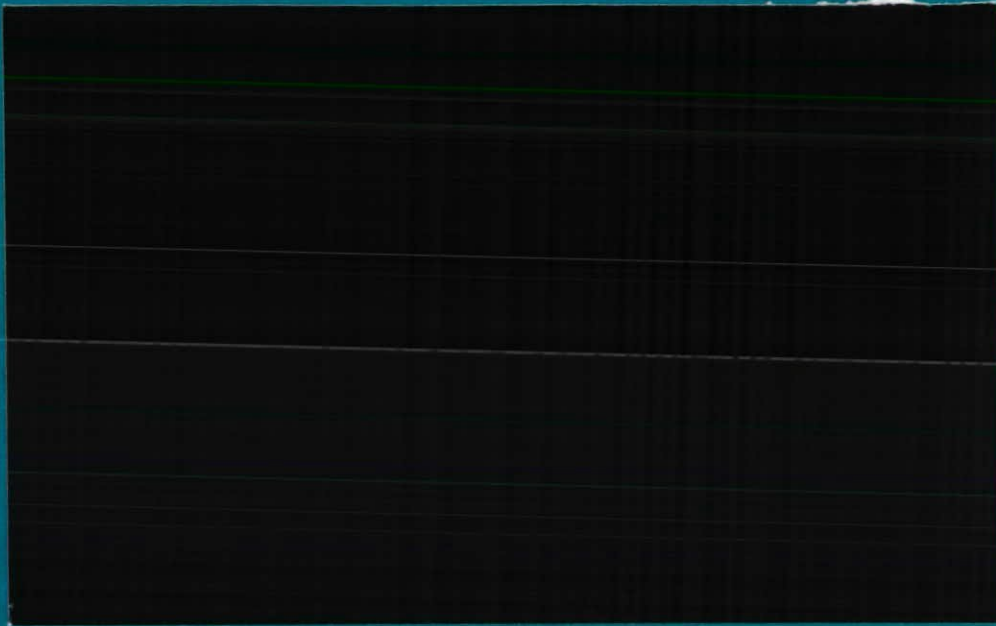


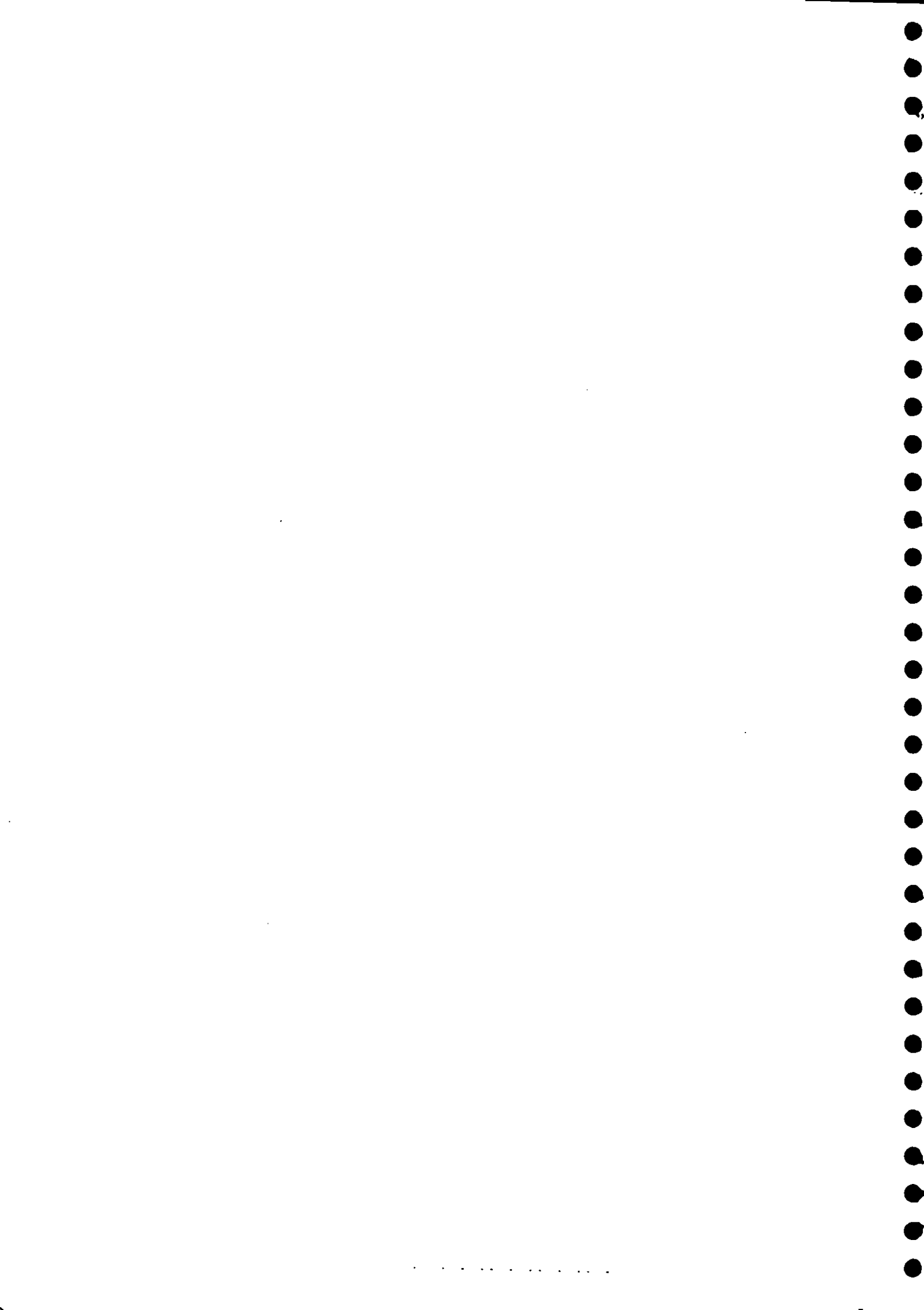


Institute of  
Hydrology

1994/020

# Overseas Development Report







**Institute of  
Hydrology**

**ODA**

## **Report on the Workshop on the Development of an Integrated Water Resources Management Plan for the Zambezi River Basin**

I R Calder, PhD

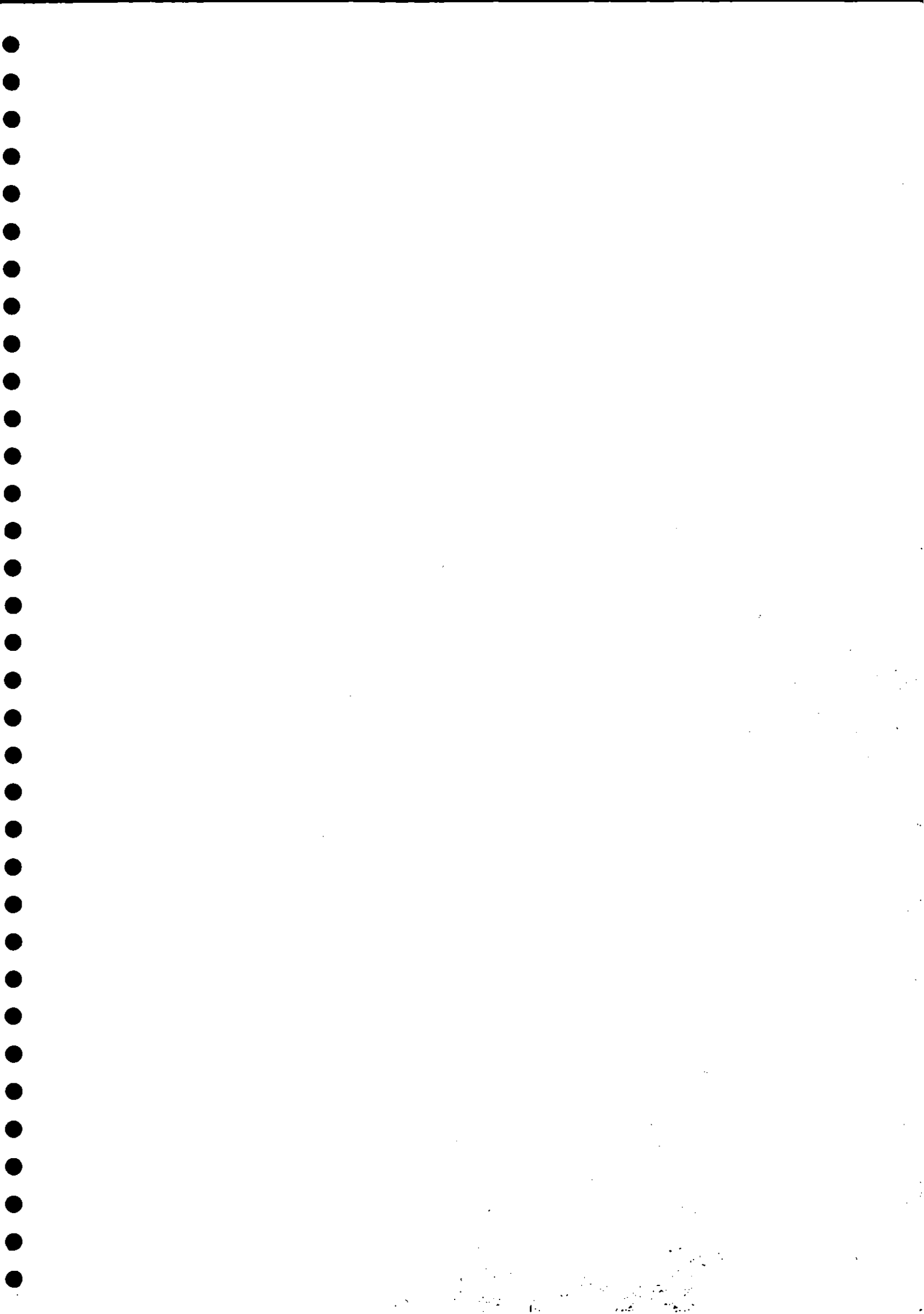
A report of work carried out for the Overseas Development  
Administration under the IH/ODA Resource Centre Scheme

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copy for your archive.  
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**Institute of Hydrology**  
**Overseas Development Report No. 94/6**



# Contents

	Page
1 SUMMARY	1
2 TERMS OF REFERENCE	2
3 PROGRAMME FOR THE WORKSHOP	3
4 BACKGROUND TO ZACPLAN AND THE ZACPROS	9
5 NOTES ON SESSIONS - PROGRESS WITH THE ZACPROS	10
6 LIST OF PARTICIPANTS AT THE LIVINGSTONE WORKSHOP	12
7 RECOMMENDATIONS	20
ANNEX 1. OVERHEADS PRESENTED BY IRC DURING THE DONOR SESSION	
ANNEX 2. OVERHEADS PRESENTED BY IRC FOR THE ROUNDUP AND CLOSING SESSION OF THE WORKSHOP	
ITINERARY	34



# 1 Summary

This report outlines the current status of the Zambezi Action Plan and makes recommendations for future ODA funded activities within the Zambezi Basin.

Although the past performance of the programmes contained within the plan has been poor (principally through poor management of the programmes) it was evident from the workshop that there is a real commitment by the SADC participating countries to further the execution of the ZACPLAN.

With the recent appointment of full time professional hydrological staff to the SADC Environment and Land Management Sector (SADC-ELMS) office in Lesotho, it is expected that the management of future Zacpros will be improved.

It is recommended that the Development Division in Pretoria discuss with SADC-ELMS the possibility of joint funding (with DANIDA) of the implementation phase (Phase 3) of Zacpro 6.

## 2 Terms of reference

- 1) In conjunction with Mr Andrew Smallwood, to represent ODA at the Workshop on the development of an integrated water resources management plan for the Zambezi basin, 2- 6 May 1994.
- 2) To act as a specialist consultant during the technical sessions at the meeting and to report on ODA funded activities in the region as they relate to water resources issues in the Zambezi basin.
- 3) To produce a tour report, within one month of the workshop, for submission to ODA which summarises the current position of the ZACPLAN and makes recommendations on which components of the ZACPLAN would fall within ODA priority areas and would be eligible for support.

Recommendations



### 3 Programme for the workshop

**WORKSHOP  
ON  
THE DEVELOPMENT OF AN INTEGRATED  
WATER RESOURCES MANAGEMENT PLAN  
FOR THE ZAMBEZI RIVER BASIN**

Intercontinental Hotel, Livingstone, ZAMBIA  
2 - 6 May, 1994                      Organizer: SADC ELMS

TENTATIVE PROGRAMME

<u>TIME</u>	<u>ITEM</u>	<u>MARKS/ASSIGNMENTS</u>
<u>1st May</u>	Participants from Riparian countries and representatives for ZACPRO 6 Consultants arrive.	SADC-ELMS
<u>2nd MAY</u>		
0800 - 0830	Registration	SADC-ELMS
0830 - 0900	Welcome Statement	ZAMBIA SADC-ELMS

SESSION 1

**Chairperson:** SWAZILAND

**Rapporteur:** LESOTHO

0900 - 0930	Briefing/Programme Details	SADC-ELMS
0930 - 1000	TEA BREAK	
1000 - 1100	Introduction to ZACPLAN/ZACPRO 6	SADC-ELMS Status and brief progress report
1100 - 1130	Discussion	

## SESSION 2

**Chairperson:** ZAMBIA

**Rapporteur:** MALAWI

- |             |   |   |
|-------------|---|---|
| 1130 - 1230 | ZACPRO 6 Data Base Project  | The Consultant presents the project and proposals for data base structure, data requirement, and station network. |
| 1230 - 1400 | LUNCH   |   |
| 1400 - 1430 | Discussion and review of proposals for data base development            |   |
| 1430 - 1530 | ZACPRO 6 Sector Studies Project   | Consultant presents the project's inception report and proposals for Terms of Reference for sector studies.       |
| 1530 - 1600 | TEA BREAK   |   |
| 1600 - 1630 | Discussion and review of proposed Terms of Reference for Sector Studies |   |
| 1630 - 1730 | Zimbabwe Country Position Paper   | ZIMBABWE  |
| 1730 - 1800 | Discussion  |   |

3rd MAY

## SESSION 3

**Chairperson:** BOTSWANA

**Rapporteur:** NAMIBIA

- |             |                               |        |
|-------------|-------------------------------|--------|
| 0900 - 1000 | Zambia Country Position Paper | ZAMBIA |
|-------------|-------------------------------|--------|

3rd MAY - TUESDAY

0830 - 0900 TOR Presentation

0900 - 1030 TOR Discussion

1030 - 1100 TEA BREAK

1100 - 1120 Zimbabwe Country Position Paper ZIMBABWE

1120 - 1135 Discussion

1135 - 1200 Zambia Country Position Paper ZAMBIA

1200 - 1220 Discussion

1220 - 1400 LUNCH

1400 - 1420 Namibia Country Position Paper NAMIBIA

1420 - 1435 Discussion

1435 - 1455 Mozambique Country Position Paper MOZAMBIQUE

1455 - 1510 Discussion

1510 - 1530 TEA BREAK

1530 - 1600 Regional Water Resources Management on the SADC-ELMS Agenda SADC-ELMS

1600 - 1700 Discussion

1700 - 1730 Water Resources Systems Management

1730 - 1800 Discussion

4th MAY - WEDNESDAY

0830 - 0850 Angola Country Position Paper

0850 - 0900 Discussion

0900 - 1000 Water Resources Systems Management

1000 - 1030 Discussion

1030 - 1100 TEA BREAK

- 1100 - 1120 Tanzania Country Position Paper
- 1120 - 1135 Discussion
- 1135 - 1200 Malawi Country Position Paper
- 1200 - 1215 Discussion
- 1215 - 1235 Botswana Country Position Paper
- 1235 - 1400 LUNCH
- 1400 - 1415 Discussion
- 1415 - 1515 Workshop conclusions and recommendations on ZACPRO 6 and SADC Water Resources Sub-Sector Activities
- 1515 - 1545 TEA BREAK
- 1600 - 1700 Registration of Cooperating Partners

**WORKSHOP  
ON  
THE DEVELOPMENT OF AN INTEGRATED  
WATER RESOURCES MANAGEMENT PLAN  
FOR THE ZAMBEZI RIVER BASIN**

**Intercontinental Hotel, Livingstone, ZAMBIA**

**5 - 6 May, 1994**

**Organizer: SADC ELMS**

**TENTATIVE PROGRAMME**

**5th MAY - THURSDAY**

**Chairperson: ZAMBIA**

**Rapporteur: SADC-ELMS**

**SESSION 1**

0830 - 0900 Opening Statement

0900 - 0930 Status and Progress of ZACPLAN

SADC-ELMS

0930 - 1030 Discussion

1030 - 1100 TEA BREAK

1100 - 1200 Summary of Workshop Proceedings

ZIMBABWE

1200 - 1230 Discussion

1230 - 1400 LUNCH

## SESSION 2

**Chairperson:** UNDP

**Rapporteur:** ODA

1400 - 1700 Donors are invited to present their activities and plans concerning water resources development in the SADC region - particularly in the Zambezi River Basin - and how this can reinforce SADC-ELMS initiatives. (Detailed programme for this session to be distributed at the workshop).

1900 - 2100 RECEPTION

6th MAY - FRIDAY

## SESSION 3

**Chairperson:** BOTSWANA

**Rapporteur:** SADC-ELMS

0900 - 0930 SADC Agenda On Water Resources Development SADC-ELMS

0930 - 1030 Discussion

1030 - 1100 TEA BREAK

1100 - 1200 Observations, conclusions, and recommendations of the workshop. ODA LONDON

1200 - 1215 CLOSING

## 4 Background to ZACPLAN and the ZACPROS

The ZACPLAN was formed by the riparian countries of the Zambezi to foster a basin-wide environmentally sound water resources planning and management system for the Zambezi Basin. The cooperating partners are UNEP, DANIDA, NORAD, and SIDA.

The first eight projects, popularly known as ZACPROs in the ZACPLAN programme were designated as Category I projects. These are:

- ZACPRO 1 - involves an inventory of completed, on-going and future water resources and related projects, evaluation of their impact on the environment and basin-wide water related information exchange.
- ZACPRO 2 - is concerned with the development of regional legislation for the management of the Zambezi river.
- ZACPRO 3/4 is directed to the development of human resources, administrative and institutional structures and technical capabilities related to the ZACPLAN.
- ZACPRO 5 - comprises the development of a basin-wide unified monitoring system for water quantity and quality.
- ZACPRO 6 - is directed to the development of an integrated water resources management plan for the Zambezi river basin.
- ZACPRO 7 - calls for environmental education and public participation in implementing the ZACPLAN, particularly ZACPRO 6; and
- ZACPRO 8 - is directed to formulating minimum standards for water supply and waste water disposal.

ZACPRO 1, 2 and 5 were funded by UNEP and accordingly implemented while ZACPRO 6 was further divided into four phases with Phase I, which has two projects; database development and sector studies, being currently implemented under funding from DANIDA, NORAD and SIDA.

ZACPRO 2, has administrative and institutional importance in the implementation of the ZACPLAN programme and, indeed, the water resources management in the SADC region. This project has proposed a SADC protocol on shared water course systems. The protocol will be considered for approval and adoption by this year's SADC Summit of Heads of States or Governments. If ratified it is expected that member countries will make the necessary legislative preparations for the introduction of the protocol.

## 5 Notes on sessions - progress with the ZACPROS

### BACKGROUND

In 1985 the riparian countries of the Zambezi met in Nairobi to discuss environmentally sound management procedures for the Zambezi basin. The formation of a Zambezi Action Plan (ZACPLAN) was further discussed in Gabarone in December 1986 and was finally adopted in 1987. The ZACPLAN has 19 defined projects (Zacpros). The implementation of the Zacpros Region in 1989.

\* **Zacpro 1** was implemented in late 1990 but the final report has not been produced. The consultant, Dr Kaltenbrunner, claims that he is still awaiting data from some of the SADC countries. SADC-ELMS have continued with the other Zacpros despite the failure of Zacpro 1. The unfinished component of ZACPRO1 have been subsumed under Zacpro 6 (Phase 1).

\* **Zacpro 2** was completed by Mr Mvalo (Malawi). A draft water resources protocol was submitted in 1992. It also proposed the creation of a monitoring unit (commission) to implement the protocol. It is expected that the unit would be responsible to SADC ELMS.

\* **Zacpro 5** (Consultant: Dr Balek Czeck Republic). The first report was submitted in Dec 1991, but has not been accepted by SADC-ELMS. The report proposed a Zambezi Environment Monitoring System (ZEMS), but the proposed monitoring programme is unevenly distributed, e.g no monitoring stations are proposed for Mozambique.

\* **Zacpro 6** was approved in Arusha in 1992.

Phase 1 has two ongoing activities:

- \* the collection of hydro-meteorological data into a database (Consultant: NORCONSULT).
- \* the carrying out of studies on sectors and their present and future influence on the water availability and quality in the river system (Consultant: DENCONSULT).

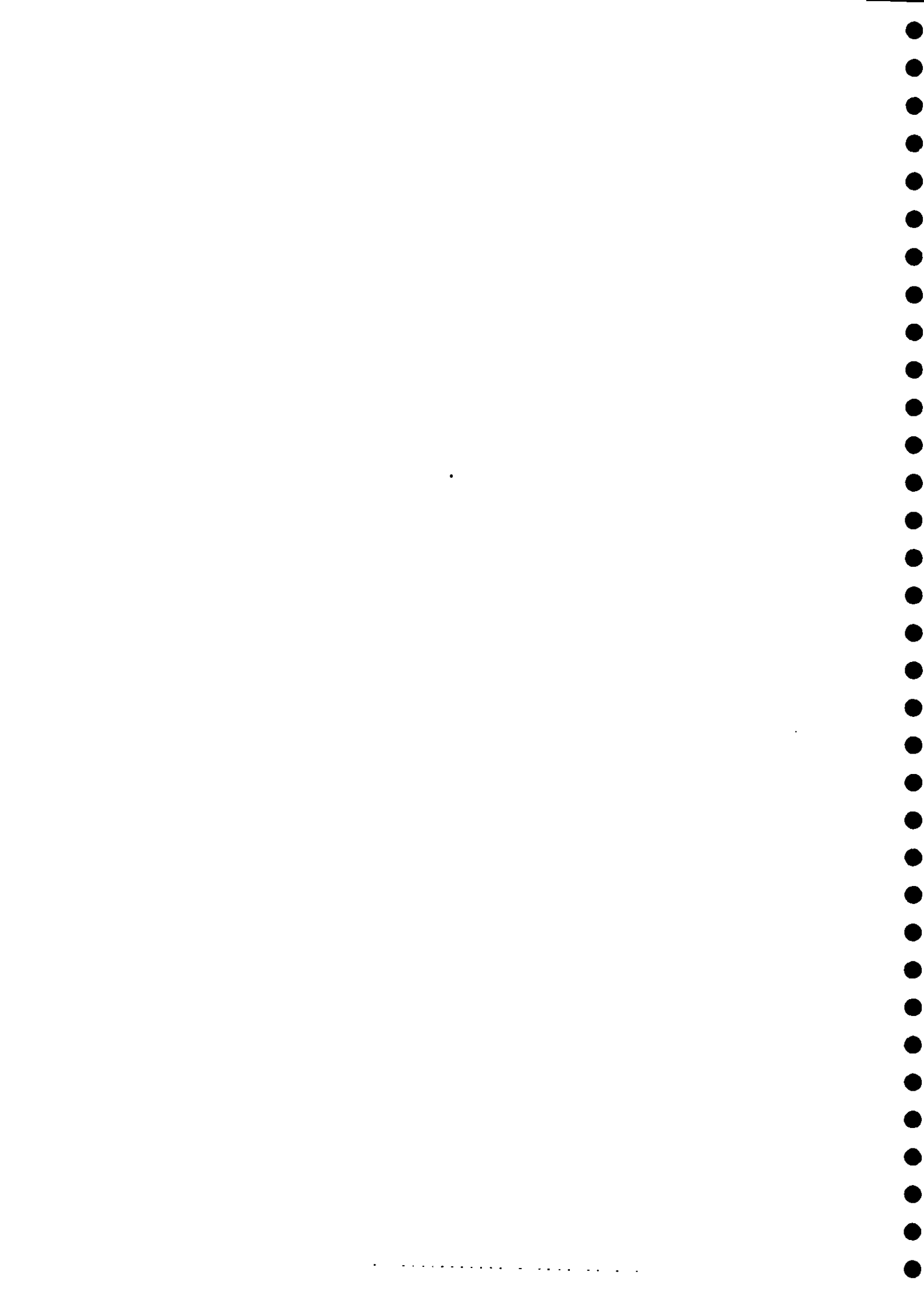
Phase 2 now has four agreed activities:

- \* development of a simulation model for predicting the consequences of water use and pollution on the downstream river;
- \* integration of the sector studies into the model;
- \* simulate the effect of various development scenarios;
- \* preparation of a draft implementation plan.

The new Phase 3 (formerly Phase 4), will be concerned with the implementation of the plan proposed in Phase 2 (the previous phase 3 will now be combined with Phase 2). DANIDA has expressed its wish to partially fund the implementation phase but would hope to do this in conjunction with other donors.



TECHNICAL DETAILS: The Okavango basin is not to be included in the Zacpro 6. The number classification of the sub-basins in Zacpro 6 follows Hydata procedures. The inception report makes recommendations for 45 hydrometric, 66 meteorological and 30 water quality stations within the basin. Although the Okavanga basin is not included in the proposed monitoring system it will be included in the historical data collection program.



**6 List of participants at the Livingstone workshop**

**WORKSHOP**  
**ON**  
**THE DEVELOPMENT OF AN INTEGRATED**  
**WATER RESOURCES MANAGEMENT PLAN**  
**FOR THE ZAMBEZI RIVER BASIN**

**Intercontinental Hotel, Livingstone, ZAMBIA**  
**2 - 6 May, 1994**                      **Organizer: SALC ELMS**

**TENTATIVE LIST OF PARTICIPANTS**

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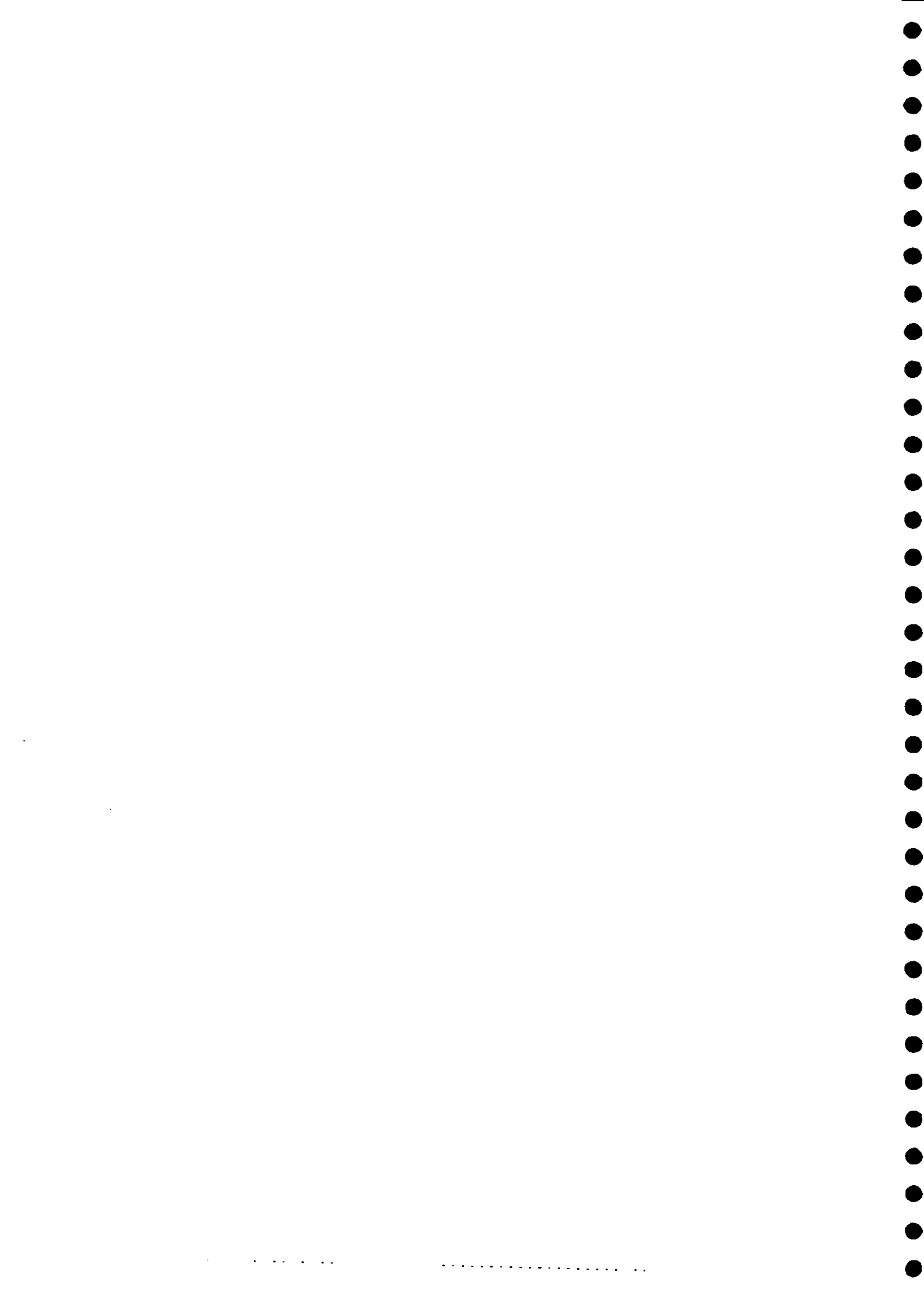
# Recommendations

Although not explicitly discussed during the meeting SADC ELMS are seeking further funding for the implementation phase (Phase 3) of ZACPRO6. DANIDA is the principal funding agency for Phase 1 and 2 and is likely to part fund Phase 3 but would be happy to cofinance Phase 3 with another donor.

The recognition by SADC ELMS of ODA's previous support in the region and the relevance of these projects to ZACPRO6 objectives, as evidenced by the invitation for ODA-London to conduct the roundup session at the workshop, indicates a firm foundation on which to build further assistance.

Although the outputs achieved so far from the ZACPROS are poor there is every indication, with the appointment of new professional staff at SADC ELMS, that greater progress will be possible in the future. It was clear from the workshop that, despite the poor performance so far, there is a real commitment to the ZACPLAN by the member countries. The production of the ZAMBEZI protocol was a major achievement and, arguably, alone justifies the existence of the ZACPLAN.

Informal discussions indicated that a combination of capital aid for the rehabilitation of hydrometric networks and possibly communication facilities in the SADC countries, together with Technical Assistance in relation to the modelling of the water resources of the region may be an area in which ODA support would be welcomed. It is recommended that the Development Division in Pretoria takes these discussions further with SADC ELMS.



**Annex 1. Overheads presented by IRC during the donor session**

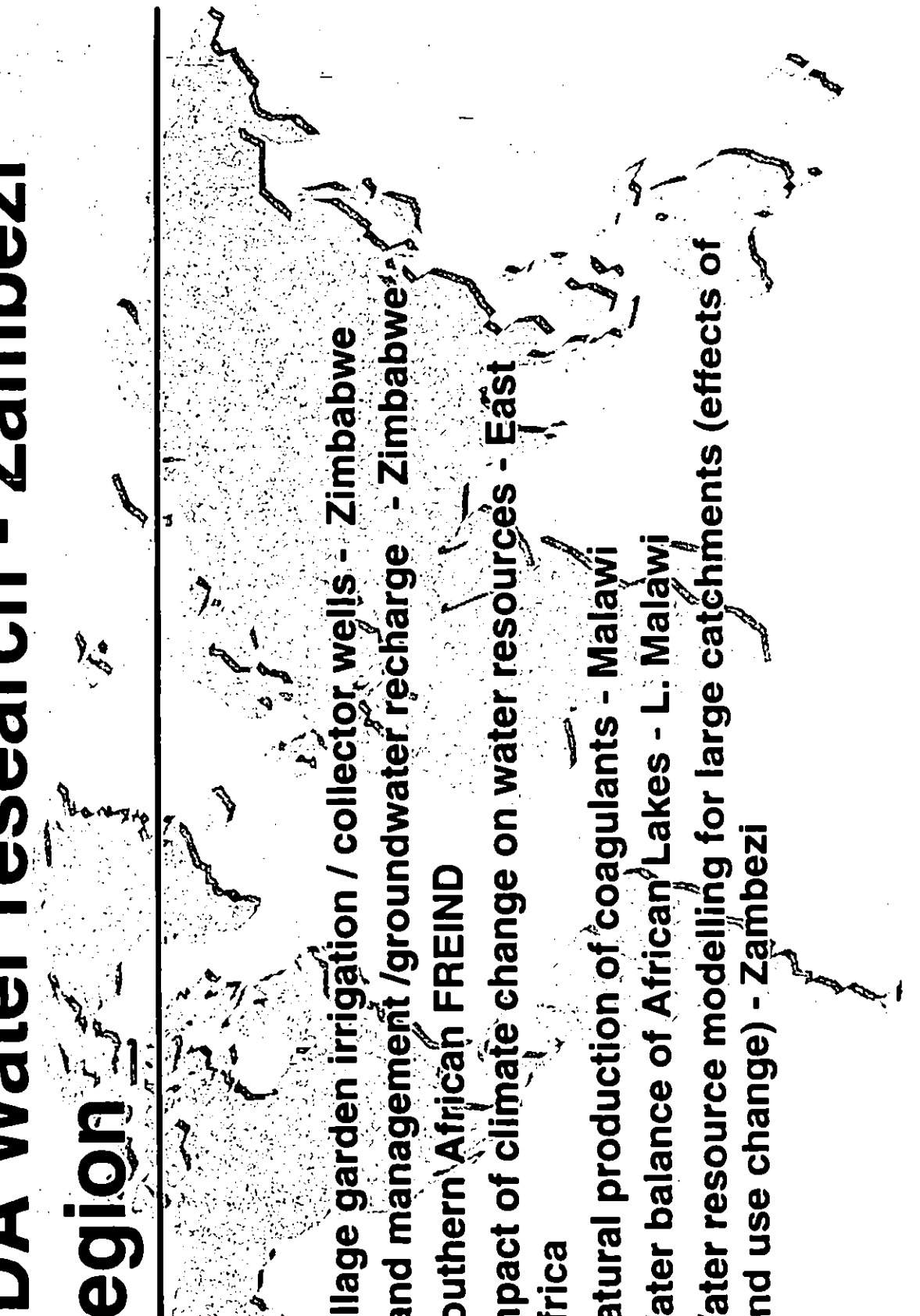
# **ODA Programme Area Priorities**

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- **Integrated water resources development and management**
- **Assessment of water resources and climate change**
- **Protection of water resources, water quality and aquatic ecosystems**
- **Improved drinking water supply and sanitation**
- **Water for sustainable food production**
- **Protection of coastal and marine environments**

# ODA Water research - Zambezi Region

---

- 
- Village garden irrigation / collector wells - Zimbabwe
  - Land management / groundwater recharge - Zimbabwe
  - Southern African FREIND
  - Impact of climate change on water resources - East Africa
  - Natural production of coagulants - Malawi
  - Water balance of African Lakes - L. Malawi
  - Water resource modelling for large catchments (effects of land use change) - Zambezi

## ***WATER BALANCE OF AFRICAN LAKES***

- \* Ongoing study to investigate the impact of land use change - deforestation on the runoff to African lakes.
  
- \* In many southern African countries lakes are crucial to the economy - hydropower, fisheries, transport.
  
- \* A knowledge of likely future levels is needed for the design of hydropower schemes, docks, irrigation schemes, etc.
  
- \* Q. Is land use important in determining the water balance? Past studies have assumed this not to be important.

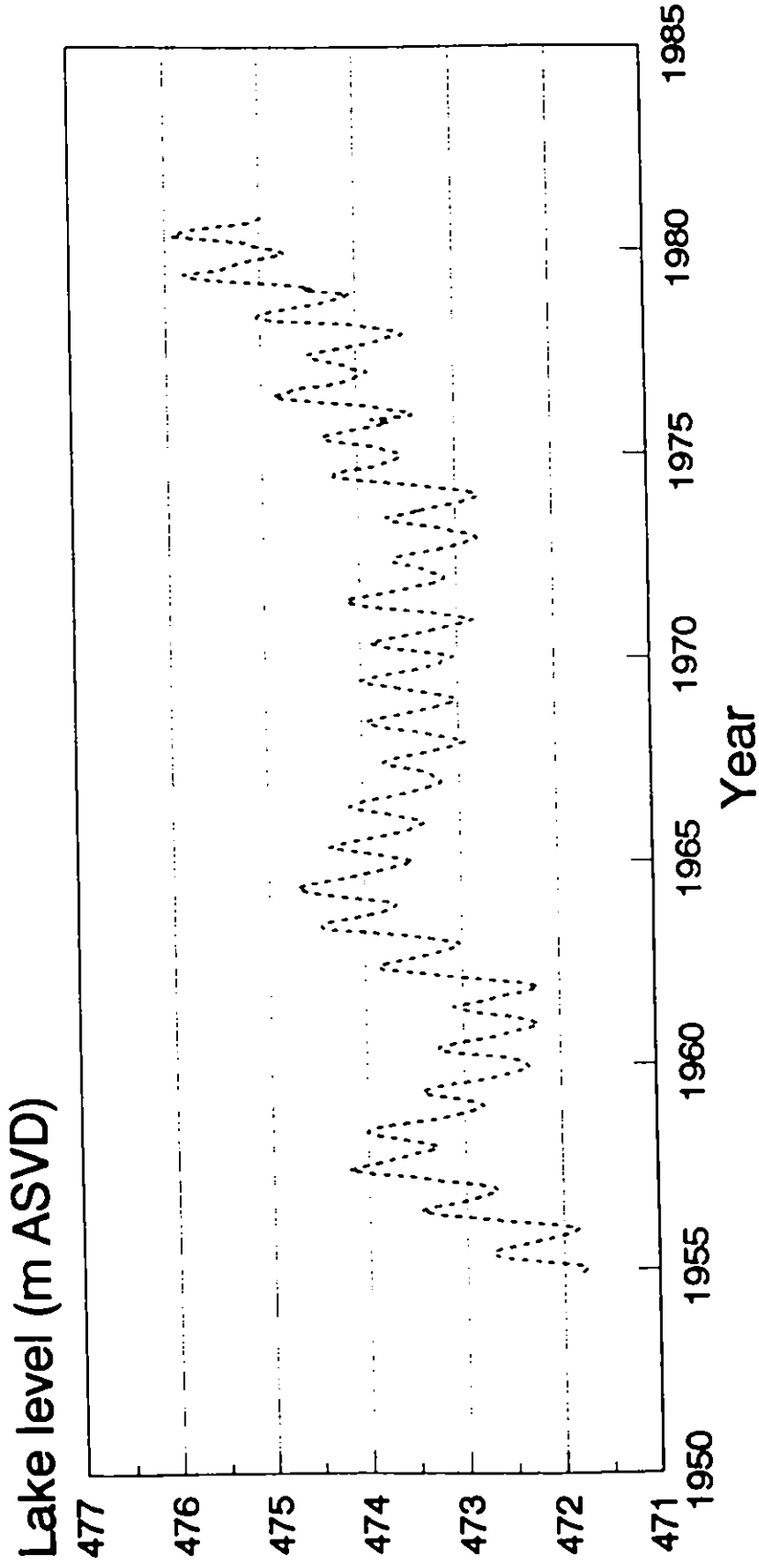


## *MALAWI STUDY*

- \* Use forest /non forest evaporation model developed under INDIA EUCALYPTS project.
  
- \* Optimise proportion of forest in Malawi by comparison with observed lake levels (1955-1980).
  
- \* Run model back in time to compare with historical records.
  
- \* Run forward in time to investigate effects of change in land use.

# Lake Malawi

Observed Lake Level



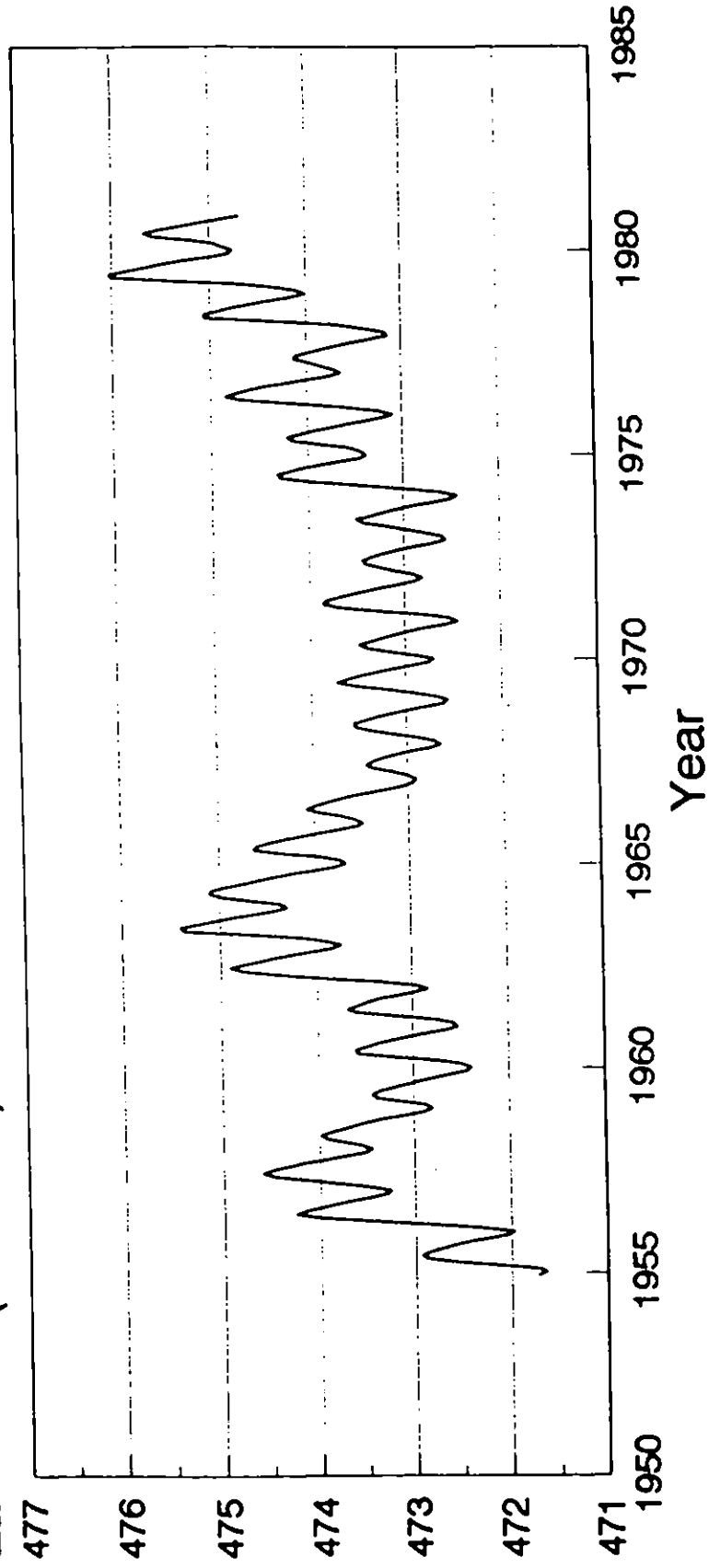
Observed

Calibration Period

# Lake Malawi

Modelled and

Lake level (m ASVD) 64% forest cover

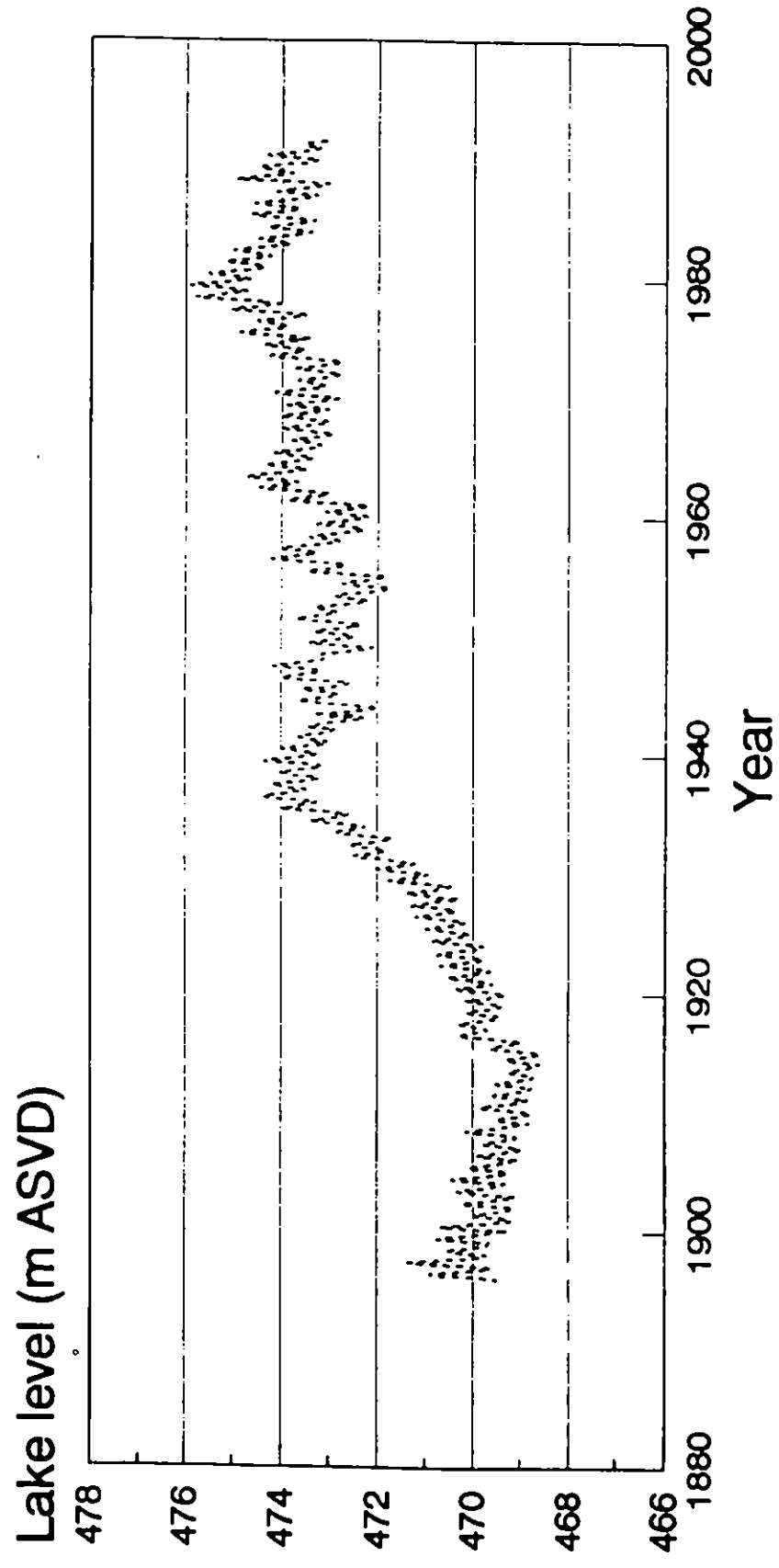


Predicted

Calibration Period

# Lake Malawi

Observed Lake Level



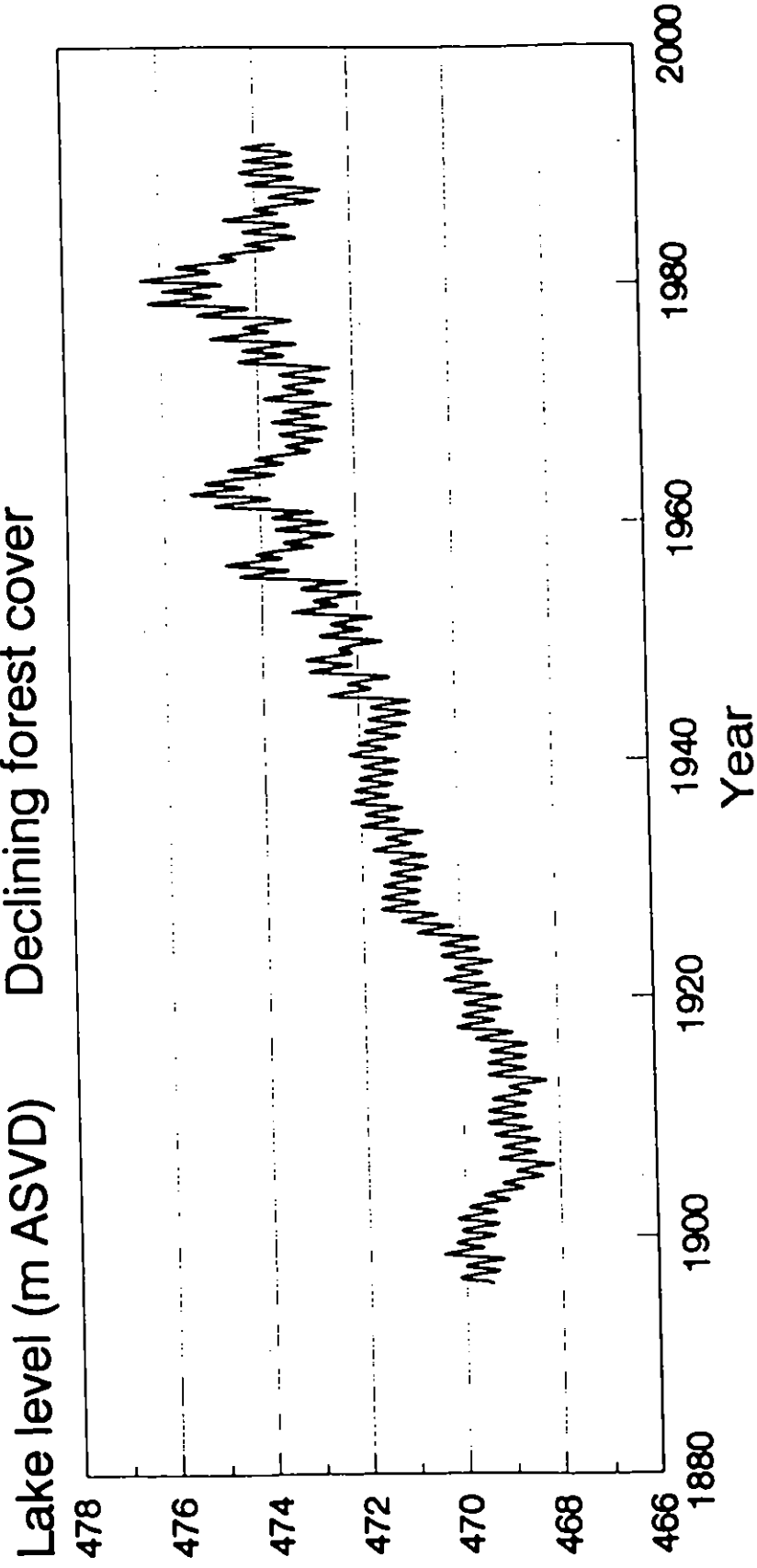
Observed

Complete Record

# Lake Malawi

Modelled and

Declining forest cover



Predicted

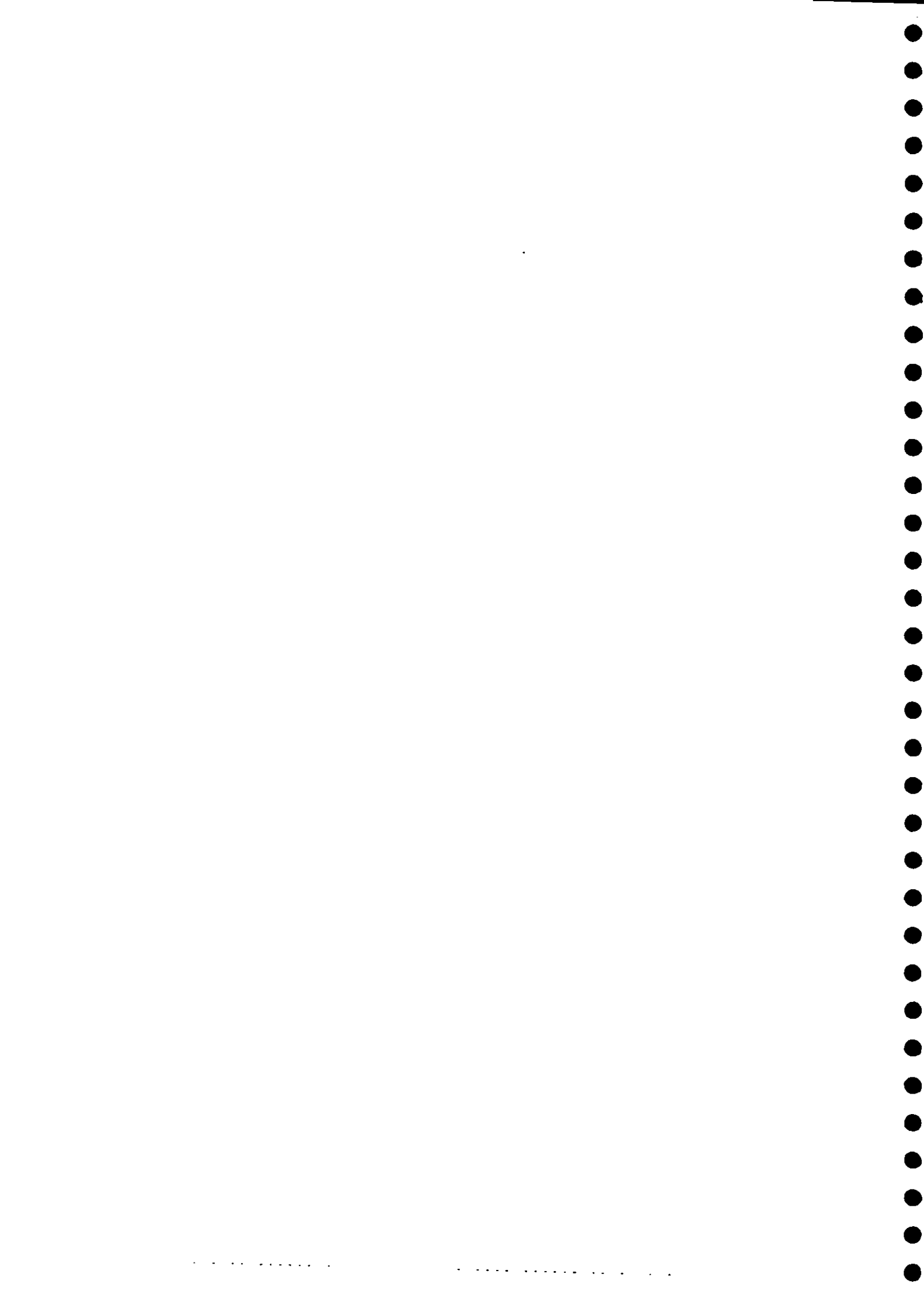
Complete Record

## *Conclusions*

- \* Land use is important in determining the water balance.
  
- \* Model describes historical lake levels without need to invoke:
  - Changing climate
  - Change in hydraulic regime
  - Large scale land use change
  
- \* Recent 13% deforestation (between 1967 and 1980) raised lake levels by about 1m during Southern African drought of 1992. \*\* effects much more severe without deforestation.

## **FUTURE APPLICATIONS**

- \* Malawi Water Dept with to use the model in real time to control the barrage.
  
- \* Design studies for future hydroelectric schemes in Malawi.
  
- \* "Environmental Impact Assessment for Land Management Interventions" for SADDCC in southern Africa.
  
- \* Climate change impacts studies in eastern Africa for ODA.





**Annex 2. Overheads presented by IRC for the  
roundup and closing session of the  
workshop**

**OBSERVATIONS, CONCLUSIONS, RECOMMENDATIONS OF THE  
WORKSHOP, 5-6 MAY 1994**

***1 RECOGNITION OF THE NEED FOR:***

**\* (a) COMMUNICATION, CONSULTATION, COORDINATION**

DONOR TO DONOR (Bilateral and Multilateral)

DONOR TO SADC ELMS

DONOR TO RECIPIENT GOVERNMENT

COUNTRY TO COUNTRY

**\* (b) REGIONAL COOPERATION**

WATER ESSENTIAL FOR LIFE

SHARING OF DATA

SHARING OF METHODOLOGIES

**\* (c) USE OF LOCAL CONSULTANTS -  
Institution building**

**\* (d) INVOLVEMENT**

LOCAL INVOLVEMENT IN DECISION MAKING

COMMITMENT BY LOCAL GOVERNMENTS

COPENHAGEN STATEMENT greater de-centralization

PROJECT MANAGEMENT UNDER NATIONAL CONTROL, Experts  
brought in when required.

\* (e) APPROPRIATE MODELLING

MUST ADDRESS THE TASK IN HAND

NOT UNNECESSARILY COMPLEX

SUSTAINABLE, Understood and used by local staff,  
preferably developed with local staff

GARBAGE IN / GOSPEL OUT CONCEPT!

\* (f) DEFINE ECONOMIC VALUE OF WATER

WORLD BANK WORKSHOP TO BE HELD

\* (g) DATA CAPTURE

POOR STATE OF HYDROMETRIC NETWORKS

HYCOS

REHABILITATE NETWORKS

TRAIN TECHNICIANS

2      **MAJOR ACHIEVEMENTS:**

- \* (a)    **SADC ELMS PROTOCOL - A MAJOR STEP FORWARD**

**A PROTOCOL ACHIEVED WITHOUT EXPATRIATE ASSISTANCE**

**A BASIS FOR MANAGING THE  
REGIONS RESOURCES**

- \* (b)    **PROVISIONAL YIELD/DEMAND FIGURES FOR THE BASIN -  
collated by Zimbabwe-Namibia**

**FOCUS ON MAJOR ISSUES:**

**IRRIGATION - HYDROPOWER - LAND USE CHANGE**

- \*        **THE WAY FORWARD?**

**ZACPLAN**

**WATER AS A SECTORIAL ACTIVITY**

**WATER COMMISSION, Structure?, Location?, TOR?, Requires a  
Workshop to discuss?**

**OVER TO THE FLOOR.....**

## Itinerary

- 31 April      Dept. for Zambia
- 1 May 1994   Arrive Lusaka
- 2 May 1994   Technical Session of Conference
- 3 May 1994   Technical Session of Conference
- 4 May 1994   Technical Session of Conference
- 5 May 1994   Donor Session of Conference, Presentation made of ODA involvement in the water sector.
- 6 May 1994   Donor Session of Conference, Conference Roundup presented by IRC, Dept. for Lusaka.
- 7 May 1994   Arrive Heathrow

