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**DZWA**



**DEUTSCHES ZENTRUM  
FÜR  
INTERNATIONALE  
FORTBILDUNG  
IN DER  
WASSER- UND  
ABFALLWIRTSCHAFT**

German Centre for  
International Training in  
Water and Waste Management

Centre Allemand de  
Formation Internationale à la  
Gestion des Eaux et des Déchets

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**Report on  
International Seminar  
"Operation and Maintenance  
of Urban Water Supply Schemes"**

Lusaka/Zambia

May 8 - 13, 1989

- hosted by: Lusaka Urban District Council  
(LUDC), Lusaka, Zambia
- organized by: German Centre for International  
Training in Water and Waste  
Management (DZWA), Bonn, Federal  
Republic of Germany
- in cooperation  
with: Lusaka Water and Sewerage Company  
Ltd. (LWSC), Lusaka, Zambia
- sponsored by: Deutsche Gesellschaft für Technische  
Zusammenarbeit (GTZ), Eschborn,  
Federal Republic of Germany

## Preface

The International Seminar on "Operation and Maintenance of Urban Water Supply Schemes" took place in Lusaka, Zambia, May 8 - 13, 1989. Sponsored and financed by the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), the event was organized by the German Centre for International Training in Water and Waste Management (DZWA) in cooperation with the Lusaka Urban District Council (LUDC) and with the support of the Lusaka Water and Sewerage Company (LWSC). In particular, the Seminar was developed for technical personnel and engineers in water management and competent decision-makers of relevant authorities in Zambia and other African countries on a partnership basis. The training was designed to effectively improve the working methods, techniques and organizational structures of represented water authorities by the exchange of practical experiences, the discussion of water supply subjects and the elaboration of adequate solutions.

This Final Report describes and covers the course of events as well as the evaluation by participants, lecturers and organizers.

Special thanks are due to all partners that have contributed to the execution of the seminar as well as to all persons and organizations that have ensured a smooth and successful event.

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## **1. Water Supply in Lusaka**

Zambia is the country with the highest urbanisation rate in Black Africa; 43% of the population lives already in urban areas. The rapidly growing population on the one hand and the problem of rural exodus on the other hand are the reasons for the constant growth of cities. The province of Lusaka including the capital has a population density of 32 persons per square kilometre, while there are less than 10 persons per square kilometre in rural areas. Thus the municipal authorities are faced with the big problem of providing the steadily increasing population of the capital with potable water of acceptable quality and sufficient quantity. To provide the entire urban area with drinking water, the water distribution net had to be drastically extended. Some of the autonomous supply units have been connected with the main network. Separate wells have been integrated into the overall network. As a consequence, pressure and flow are difficult to control. The water supply system is extremely susceptible to failure and requires rehabilitation. The high water losses and, furthermore, the consumer habits of water wastage cause a consumption of 400 litres per day and inhabitant. Special attention must be paid to quality conditions of the water exploitation. About 50% of the consumed water originates from groundwater in the urban area and is fed into the distribution net without treatment. Because of the karstic underground, the aquifer is endangered by pollution and contamination due to anthropogeny, especially, since the covering layer is partly very thin. The remaining 50% of the drinking water is taken from the nearby river Kafue and is treated in the efficient treatment plant. However, the fertilizer plant above the extraction location represents a contamination potential of the water.

Therefore, the municipal administration of Lusaka regards it as its priority task to minimize the water losses and to ensure an uninterrupted drinking water supply for the urban population. The package of initiated measures includes:

- Rehabilitation of treatment plant at the river Kafue
- Educational campaigns for the population regarding the economical use of water
- Introduction and implementation of adequate tariff structures
- Installation of an independent institution of water supply and sewerage
- Preparation of rehabilitation
- Instruction and training of operating and management personnel

The Lusaka Water and Sewerage Company Ltd., founded in the meantime, has successfully started its work in agreement with the municipal administration of Lusaka. The exemplary efforts and accomplishments, demonstrating the advantageous development of the water supply system of Lusaka, are the reasons for an international exchange of experiences.

## **2. The Training Seminar - Organization and Targets**

In cooperation with the Lusaka Urban District Council (LUDC) and by order of the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), the German Centre for International Training in Water and Waste Management (Deutsches Zentrum für Internationale Fortbildung in der Wasser- und Abfallwirtschaft - DZWA) has organized a six-days training course called "Operation and Maintenance of Urban Water Supply Schemes" to be executed by Zambian and German lecturers. The seminar was extensively supported by the Water and Sewerage Company Ltd.. Representatives of this institution took part in the training course.

The seminar covers scientific and technical elements as well as recent findings and practical experience of urban water supply. It also includes the issue of quality control. Special attention is drawn to the exchange and communication of practical experience among seminar participants.

The target group of the seminar consists of technicians and engineers of waterworks and competent decision makers and experts of relevant and responsible water authorities in Zambia and other neighbouring countries.

The training seminar in partnership is designed to communicate modern and practice-oriented processes and procedures by means of lectures, field training, and an excursion. The exchange and communication of practical experiences and the discussions about the actual issues and problems are intended to enable the participants to perform their work in a time-saving and effective way. Taking into account the recognized needs and requirements, the following subjects receive special attention:

- Network operation and its organization, rehabilitation and maintenance of the distribution network
- Decrease of water losses
- Pipe materials and fittings
- Drinking water quality, protection of karstic aquifer, water treatment
- Water quality control and hygiene

The seminar course also includes:

- Seminar files (copies of all lectures and papers as well as reprints for use during the field training)
- Various technical informations
- Videos

### 3. The Program

Monday, May 8, 1989

09.30 h **Opening session**

Introduction  
(W. Dirksen)

Welcome and opening addresses:

The Senior District Governor  
Hon. R. B. Banda, MP

H.E. Dr. K. Timmermann, Ambassador of the Federal  
Republic of Germany

10.30 h Coffee break

11.00 h Introduction of the German lecturers  
(W. Dirksen)

Introduction of the Zambian lecturers  
(J. Hendrich)

Chairman of Discussion: I. Nyumbu

11.30 h **Water supply of Lusaka**  
(J. Hendrich, E. Nyirenda, G. Fischer, D. Kane)

12.30 h Lunch break

14.30 h **Structure and management of a company  
charged with water supply**  
(G. Höper)

16.00 h Coffee break

16.30 h **Lusaka water project**  
(J. Hendrich, D. Kane)

18.00 h End

19.00 h Reception



Tuesday, May 9, 1989

Chairman of Discussion: W. Shawa

- 09.00 h **Water distribution - basic requirements for operation and maintenance**  
(W. Hirner)
- 10.30 h Coffee break
- 11.00 h **Monitoring by process control**  
(U. Reicherter)
- 12.30 h Lunch break
- 14.30 h **Study tour**  
Waterworks at Kafue river
- 18.30 h End

Wednesday, May 9, 1989

Chairman of Discussion: J. Kaluwa

- 09.00 h **Strategies for the implementation of institutional reorganization of the water and sanitation sector in Zambia**  
(I. Nyumbu)
- 10.00 h **Design approach to water and sewerage problems relative to urban (predominantly high density) and rural communities**  
(P. Ngulube)
- 11.00 h Coffee break
- 11.30 h **Water distribution - inspection and maintenance**  
(W. Hirner)
- 12.30 h Lunch break

Chairman of Discussion: E. Nyirenda

- 14.30 h **Training program of ITC Lusaka**  
(R. Ebrecht)
- 15.00 h **Materials stores management**  
(G. Höper)
- 16.00 h Coffee break

Wednesday, May 9, 1989 (cont'd)

In the Chair: Mrs. M. Nsomi

16.30 h **Ground water pollution**  
(U. Reicherter)

18.00 h End

Thursday, May 11, 1989

Chairman of Discussion: Muleya

09.00 h **Water quality and hygiene**  
(U. Reicherter)

Video film: "Water and Sewerage Treatment"

10.30 h Coffee break

Chairman of Discussion: P. Ngulube

11.00 h **Water treatment - methods and techniques**  
(K.-H. Engel)

12.30 h Lunch break

14.30 h **Field training:**

**Inspection and maintenance of water mains**  
(W. Hirner)

**Ultrasonic discharge measurement -  
demonstration**  
(G. Fischer)

**Water quality analysis**  
(U. Reicherter)

18.30 h End

Friday, May 12, 1989

In the Chair: Mrs. P. Okeowo

11.00 h **Water treatment - operation and maintenance**  
(K.-H. Engel)

12.30 h Lunch break

Friday, May 12, 1989 (cont'd)

14.30 h **Water reservoirs and hygiene**  
(U. Reicherter)

16.00 h Coffee break

16.30 h **Water distribution - water losses**  
(W. Hirner)

Video film: "Cement mortar lining of water supply  
mains"

18.30 h End

Saturday, May 13, 1989

Chairman of Discussion: W. Dirksen

09.00 h **Activities of U.A.D.E.**  
(Koffi N'Dri)

09.30 h **Final discussion and evaluation**  
(J. Hendrich, W. Dirksen)

10.30 h Coffee break

11.00 h **Closing session**

Handing over of certificates  
(N.J. Mapala, G. Höper)

Farewell by the organizers  
(W. Dirksen)

12.00 h Lunch

13.00 h End

#### 4. Report

about the International Seminar

"Operation and Maintenance of Urban Water Supply Schemes"

May 8 - 13, 1989

which took place in the Hotel INTERCONTINENTAL Lusaka, Zambia.

Monday, May 8, 1989

The opening session starts with the national anthem.

On behalf of the German Centre for International Training in Water and Waste Management (DZWA) W. Dirksen addresses words of thanks to

- The Senior District Governor Banda, M.P.
- H.E. Dr. Timmermann, Ambassador of the Federal Republic of Germany
- The District Executive Secretary Mapala
- the employees of the Lusaka Water and Sewerage Company and the colleagues of Messrs. Hydroplan
- the German Agency for Technical Cooperation and its Project Administration Office in Lusaka
- the German and Zambian lecturers

and requests the Senior District Governor to open the seminar event.

The Senior District Governor welcomes the participants and guests and highly appreciates the intended discussion. He draws the attention to the model of the City Council of Lusaka, which founded an independent company to operate the city's water supply, and underlines the special support by the Federal Republic of Germany.

The Ambassador of the Federal Republic of Germany emphasizes the engagement of his country for the development programs regarding the water sector in Zambia. In particular, he welcomes the ongoing exchange of experiences between German and African waterworks.

The Zambian press and television are present at the opening session.

After the coffee break, W. Dirksen introduces the German lecturers, and J. Hendrich informs about the Zambian lecturers.

Chairman of Discussion of the event's first day is I. Nyumbu, Advisor for the International Drinking Water Supply and Sanitation Decade, Department of Water Affairs, Ministry of Water, Lands and Natural Resources, Zambia

In their reports on the water supply of Lusaka, J. Hendrich, G. Fischer, E. Nyirenda, and D. Kane inform about the present situation and they recognize priorities to improve the water distribution net and the personnel qualifications. The long-term education in the industrialized country does not meet, as the reporters express, the actual demand.

During the discussion the efforts of the Lusaka Water and Sewerage Company are explained, i.e. to educate the population how to avoid water wastage and to save money. The vandalism in connection with public water utilities is blamed. The supervision of water discharges and qualities is regarded as being of special importance. To reduce the extremely high losses, the rehabilitation of the supply network is indispensable.

After lunch, G. Höper gives an understanding of the organizational structure of the Municipal Waterworks of Essen as an example of water management in an industrialized country.

During the discussion it is elaborated that water supply has to be operated according to economic aspects. Therefore, an independent company should be formed which only permits limited influence on behalf of politicians. The task of a water supply is to operate efficiently and consumer-oriented but also to gain revenues for investments and maintenance purposes.

In the last reports of the first day of event, J. Hendrich makes the participants acquainted with the program to rehabilitate the water supply system of Lusaka. He explains the independent organization of Lusaka Water and Sewerage Company. Additionally, D. Kane informs about the demand and the program to educate and train the waterwork's personnel.

During the discussion, the problems are pointed out how to supervise the water consumption and how to control the respective revenues. The necessity to make use of modern technical instrumentation and equipment is emphasized. Furthermore, the population should be made conscious of its responsibility and the value of a regular water supply.

Tonight, the organizers of the International Seminar invite all participants to the Reception. The Ambassador of the Federal Republic of Germany is present.

Tuesday, May 9, 1989

The discussions are led by W. Shawa, Consultant in Lusaka

During the first lecture, W. Hirner has the opportunity to deliver some statistical figures on the water supply of Nuremberg which provides about half a million people with potable water. The mean consumption including the industry amounts to 210 litres per capita and day, the rate of unaccounted water mostly induced by consumption of waterworks is about 8 % of the total water demand. For operation and maintenance about 50 skilled

labourers are available. W. Hirner reports about basic requirements for operation and maintenance in respect of water distribution networks. He underlines the immense importance of collecting data as a prerequisite for any economic network management. Such information should be on site as well as in the office.

In the following discussion the huge difficulties are shown to get informations about the existing pipe system and to establish adequate drawings and maps. Since the execution of pipe detection is not possible, the pipes have to be located by excavations.

U. Reicherter explains the water supply situation in the city of Essen which provides about 600,000 people with potable water. The mean consumption amounts to the same figure as in Nuremberg. He gives an impresssion on the sophisticated monitoring of process control of the water lifting, treatment and storing. In Essen, special attention has been given to protect the treatment plant against floods of the nearby Ruhr river. Effective technical installation saves electric power and manpower. It is recognized, that some specific points of view are of interest to the water supply operation in developing countries.

The audience discusses the aspects of groundwater recharge by infiltration ponds which is realized in Essen and pays special attention to different ways of operation of filters.

In the afternoon, the destination of the study tour is the waterworks near the Kafue river. The participants inspect the rehabilitated intake and treatment plant which is of optimum condition. The raw water is taken off from the Kafue river and purified by flocculation and sedimentation. The special equipment of the treatment plant allows the application of a hand-operated system. The installations are well maintained.

Wednesday, May 10, 1989

The discussion is led by J. Kaluba, Consultant in Lusaka.

I. Nyumbu reports about the strategies for the implementation of institutional reorganization of the water and sanitation sector in Zambia. In this context, he indicates the points of weakness, as there are shortages of trained manpower, lacks of adequate tariff systems, gaps of responsibility, poor incentives and motivation, lacks of master-planning, etc. To overcome these problems, the Zambian Water and Sewerage Company (ZWASCO) should be established as a kind of holding company. Local activities should be undertaken by subsidiary companies on regional level.

In the discussion it is emphasized, that the implemented river authorities are responsible for the groundwater as well as for the surface water. Various tariff systems should be adapted to the respective local conditions. The wide difference between public and private salaries is recognized as a big problem.

P. Ngulube illustrates in his report the experiences in design approach to water and sewerage problems concerning urban and rural communities in Zambia. He gives lots of exemplary figures to calculate and construct water supply installations in African countries.

The audience discusses the required governmental control of the use of water resources.

In the following contribution, W. Hirner pays special attention to the inspection and maintenance of water distribution systems. He points out that a permanent control by periodical checks and tests of pipe network and equipment is indispensable. According to his experiences, five hours per pipe-kilometre and one hour per hydrant are mean inspection times. Good organization and immediate reaction guarantee a minimum of



failures. A catalogue of criteria for rehabilitation allows specific decisions about repair or replacement.

The discussion concentrates on the subject of pipe rehabilitation. By methods of cement mortar lining an extension of life of more than 50 years is feasible.

The first chairman of the afternoon is E. Nyirenda, Counterpart Director, Lusaka Water and Sewerage Company.

R. Ebrecht reports about the program of the Industrial Training Centre Trust (ITC). To educate skilled workers, there are courses on a long-term basis (up to three years) and short-term basis (4 to 12 weeks) in Lusaka. Special attention has been paid to the four weeks' course "Pump Maintenance".

During the discussion, R. Ebrecht mentions that the practical training in companies is supervised by ITC. Students from outside of Zambia are also accepted.

After that, G. Höper reports about aspects of store management. Materials should be protected against weather and theft. Effective control and qualified supervision guarantee an economically operated store. To optimize the stock, it is advisable to put all stores of a water supply system under one supervision.

During the discussion it is pointed out that decisions about material purchase can only be made after the technical management has been consulted. Preventive measures against unauthorized personal removal have to be taken. Stores must be watched permanently.

For the last contribution, Mrs. M. Nsomi, Ministry of Land, Water and Natural Resources of Zambia, takes the chair.

U. Reicherter reports about the sources and ways of groundwater pollution. To avoid these advantageous antropogenic influences

on wells, the Aquifer has to be protected by various protection zones. Chemical analyses of continuously taken water samples allow an effective quality control.

The discussion is dominated by questions, raised upon design and handling of groundwater protection zones. The audience agrees that protection zones are indispensable; groundwater models, pumping tests and tracer tests are useful methods to fix the limits of the required area.

Thursday, May 11, 1989

The chair for the first contribution is held by Dr. Muleya, Head of Water Quality Control, National Council for Scientific Research in Lusaka. In his opening speech he focusses the attention on the environmental aspects of water management.

U. Reicherter indicates the interdependence of water quality and hygiene. The quality limits set up by the European Community and the WHO, should be reached and controlled by the Health Department. Extremely important is the disinfection by chlorine; in cases of emergency, hyperchlorine should be available. It is recommended not to use chlor dioxide or ozone. For analysis purposes, simple equipment permits acceptable measurements. It is strongly pointed out to use several samples. Long-term evaluations of analyses should be carried out by help of a personal computer.

During the discussion, it is stated that fluoride can be reduced with calcium salts. Against turbidity generally helps filtration. Pit latrines should not be used in the area of protection zones of water wells.

After that a video film of Messrs. Sulzer informs about water and sewerage treatment.

The chair for the second report is held by P. Ngulube, Consultant in Lusaka.

K.H. Engel reports about the design practice for water treatment. He points out that each treatment plant has to be equipped with a laboratory to minimize the consumption of chemicals each day. He describes the various water treatment techniques as there are sedimentation, aeration, destabilization, flocculation, chlorination, filtration, and sludge preparation.

In the discussion it is clarified that only fresh sludge can be used to stimulate the flocculation. Lime can be used carefully to control the pH value; if the pH value comes up too high, the flocculation is reduced. The best way to optimize the reactions can be found by trials.

In the afternoon the field training takes place. Two groups are formed practicing two kinds of exercises.

W. Hirner carries out an inspection case study on the side of a main hole and a valve. By means of a standard leak detector of Messrs. Seba Dynatronic a leaking valve is located.

Additionally, a discharge measurement with an ultrasonic instrument is demonstrated by G. Fischer. The measurements are useful to ascertain calculations of networks and to estimate losses.

During the discussion it is strongly recommended to carry out visible inspections of the supply net and to repair recognized breaks. It is assumed that more than 50 % of the water losses can be located by visible inspections and reduced by respective repairs. It is furtheron discussed in which way repair groups have to make decisions and to carry out their tasks. Leak detectors are normally not in a position to locate non-metallic pipes.

U. Reicherter trains five small groups on the use of instruments to measure chlorine, pH and conductivity in respect of two different water qualities. The instruments have to be calibrated. The comparison of the different results of the small groups indicates, that acceptable values can only be reached by analysing and comparing several samples.

During the discussion it is pointed out that the pH value depends on the temperature. The flocculation itself depends on the pH value.

Friday, May 12, 1989

Mrs. P. Okeowo, Senior Biochemist of Lusaka Water and Sewerage Company, takes the chair.

In continuation of his contribution about water treatment, K. Engel reports about the operation and maintenance of the plants. He explains in detail the requirements in respect of qualified staff and key personnel to optimally run a water treatment plant.

The audience discusses the various possibilities to control the treatment process. Special attention is given to optimized consumption of chemicals.

After lunch, Reicherter reports about hygiene aspects of water supply tanks. Bacteria and algae find optimal living conditions on water tank walls, especially just above the water surface. Concrete storage tanks are suited better than steel tanks which favour the growth of bacteria due to the heating-up by solar radiation. Therefore, steel tanks should be isolated. Coats of paint and plastic platings on the inner tank sides have several disadvantages as they serve as culture medium for bacteria and algae. Various types of appearances of pollution are demonstrated.

During the following discussion it is felt, that presently regular cleansing of water supply reservoirs is not usual. The participants agreed that permanent inspection and regular cleansing are indispensable.

After the break W. Hirner explains the results of a consultation of participants which show that high water losses ranging between 30 - 60 % are normal in water supply networks in African countries. Regular inspections are not usual. An assessment of water losses is possible during periods of poor consumption, mostly during the night. As a first step to reduce losses it is recommended to execute visible inspections followed by immediate repairs of the recognized damages.

The participants discuss various criteria to decide between repair or rehabilitation in case of damages. Secondly, it is indicated, that non-paying water consumers could be punished by stopping the water supply.

The following film informs about the application of cement mortar lining to improve incrustated metallic distribution and transmission mains. The lining guarantees many years of corrosion prevention.

During the discussion, W. Hirner indicates that the improved hydraulic conditions allow a discharge increase of 20 to 30 %. The lining does not impair the normal water quality. Lining is economical in the case of pipes laid under tared roads.

Saturday, May 13, 1989

For the first presentation, W. Dirksen takes the chair.

Koffi N'Dri informs the audience about the structure and activities of the Union of African Water Suppliers (UADE). He in-

vites the African countries to establish national committees and to join UADE. The non-governmental organization promotes the exchange of information and data and offers a continuous program of workshops and seminars.

During the discussion, Koffi N'Dri points out, that membership fees range from 1,000 to 5.000 US \$ annually. At the present time an expert of the Ivory Coast is President.

For the following open discussion and seminar evaluation, a draft paper is presented which is extensively debated. The final outcome is regarded as a paper of consensus (see chapter 5).

After the break the certificates are handed over to the participants by Lusaka District Executive Secretary Mapala and G. Höper.

In his closing speech, W. Dirksen underlines some important results of the seminar, especially concerning the institutional framework, consumers' responsibility, operation and maintenance. He thanks all participants from 9 African countries for their fruitful contributions and excellent cooperation and conveys special thanks to J. Hendrich, E. Nyirenda and D. Kane of the Lusaka Water and Sewerage Company for their great organizational support. Then he hands over to District Executive Secretary Mapala a tin plate with pictures of the city of Bonn.

## 5. Points of Agreement

### International Seminar on Operation and Maintenance of Urban Water Supply Schemes

A Seminar was held in Lusaka/Zambia from 8th to 13th May 1989. The attending participants from 9 countries including Lesotho, Botswana, Kenya, Uganda, Zimbabwe, Ethiopia, Tanzania, Zambia and the Federal Republic of Germany adopted the following resolutions:

#### INSTITUTIONAL FRAME WORK

- 1 The task of a water supply institution is to supply a safe and reliable source of water in the most efficient and cost effective manner to its consumers.
- 2 In order to fully achieve this end, the organizational framework established should be autonomous. It should be free to make independent management decisions on its day to day activities.
- 3 In this light, the effort presently being undertaken by Zambia to reorganize the water supply and sanitation sector is fully supported. The concept of an independent group of companies answerable to a central board should be implemented with Lusaka serving as a model for the sector.
- 4 In order to ensure the success of the reorganization of the water and sanitation sector through the formation of autonomous institutions, National Governments and the Donor Community should fully support these efforts on a long term basis.
- 5 The provision of water and sanitation services should be the responsibility of one parent institution.

CONSUMER RESPONSIBILITY

- 6 Potable water is not free, everyone should pay a fair price for the quantity of water used. A tariff structure should be designed to generate sufficient revenues to cover operation and maintenance costs as a minimum and, ideally, total operational costs including capital investments. Cross subsidization may be used as a means to ensure affordability and social acceptability for water charges.
- 7 Community water committees should be established where appropriate, and encouraged to accept responsibility for the management of their water supply. Punitive measures should be introduced and enforced against those who vandalize water installations.

OPERATIONS AND MAINTENANCE

- 8 In the processing of data and other information used for the design, maintenance and mapping of engineering works, micro-computer based applications should be utilized whenever possible.
- 9 Maps, drawings and marker posts are indispensable for the operation and maintenance of a water supply network. Every pipe, fitting, valve, hydrant etc. should be recorded by location, specification and state of repair.
- 10 Distribution systems, water reservoirs, water works, wells etc. have to be inspected regularly as part of a preventive maintenance programme. In case of defects a record has to be made followed by immediate action for repair.
- 11 Systems should be designed and installed such that they are capable of being maintained and operated using locally



available resources and manpower, finance and technology as much as possible.

- 12 Stores with qualified supervision and controlled delivery of material are indispensable. Material has to be protected against weather and theft.

#### MANPOWER

- 13 As a first priority, emphasis should be given to use of local institutions, supported where necessary by external experts, for the education and training of staff in all fields; technical, financial and administrative.

#### WATER QUALITY

- 14 National water quality standards should be determined and maintained. Drinking water quality should be controlled continuously by an independent national agency, e.g. Health Department.
- 15 In water treatment works the raw and treated water should be monitored daily for pH, turbidity, chlorine residual, conductivity and bacteriological quality as a minimum.
- 16 Every water treatment works should have a properly equipped laboratory to carry out water quality analysis to monitor water quality and optimize the use of chemicals.
- 17 Adequate protection should be provided around every water source to prevent contamination from industrial, waste disposal and agricultural activities.

FURTHER INVOLVEMENT OF DZWA

- 18 Due to the success of this seminar, DZWA among others should continue to be involved in the support of organization and training efforts being undertaken in the water and waste water sector in Central and Southern Africa.
  
- 19 The financing partners of DZWA should reinforce the organization in its effort to promote the exchange of information and cooperation between German companies and water management institutions and similar institutions in developing countries.

## 6. Reports and Commentary in the Media

### 6.1 Press

Articles published in the daily press in Lusaka on the occasion of the International Seminar on "Operation and Maintenance of Urban Water Supply Schemes" (see Attachment)

Heading:	Date	Name
	of Publication:	of Newspaper:
Lusaka leads	May 9, 1989	Times of Zambia
Lusaka water firm plans advance - Banda	May 9, 1989	Daily Mail
Water firm gets funds	May 10, 1989	Times of Zambia
Water sector's future bleak, says expert	May 11, 1989	Daily Mail
Water sector below par	May 11, 1989	Times of Zambia
Opinion	May 11, 1989	Times of Zambia

### 6.2 Radio

On May 9, 1989, the Zambian Radio reported in its evening news at 19.00 h about the opening of the International Seminar by Hon. Rupiah Banda and H.E. Dr. K. Timmermann.

### 6.3 TV

On May 9, 1989, the Zambian Television reported in its evening news at 19.00 h about the opening of the International Seminar by Hon. Rupiah Banda and H.E. Dr. K. Timmermann.

Interview on TV "Good Morning Zambia":

Live television program on Saturday, May 13, 1989,  
approx. 08.00 h

Participants: E. Nyirenda  
Koffi N'Dri  
W. Dirksen

# Lusaka water firm plans advance — Banda

By Mail Reporter

PREPARATIONS for the launching of the council owned water company have reached an advanced stage, Lusaka governor Rupiah Banda said yesterday.

The city's water supply operations were being transformed in order to establish the water company which will operate as a limited liability firm independent of the council.

Opening the Operations and Maintenance of urban water supply schemes seminar at Inter-Continental Hotel yesterday Cde Banda disclosed that the operations were in the final stages but he did not say when they would be completed.

The council was also undergoing a series of major capital programmes financed by a number of donors while other requests were still awaiting approval from donors, he said.

The organisations which have so far showed interest in the council's programmes are the African Development Bank, the Japanese and Italian governments.

He disclosed that some donor governments were worried that they would be involved in projects that would never end.

It was imperative that the council follows a closely co-ordinated approach both from its operations and capital point of view to avoid doubling their capital abilities.

"The scope of work required to fully address the problems facing Lusaka mandates that we maximise use of all funds available and allow as much flexibility as can be permitted under various donor constraints," he said.

The council needed to maintain some flexibility and ensure that the programmes are carried forward, strengthened and make sure that decisions are taken in at the right time.

And German Ambassador Dr Klaus Timmermann urged the council to create confidence as a way of convincing the donors that their investment was worthwhile.

He said that the task of rehabilitating the water works was a gigantic one which could only be solved if the various donors pooled their resources together.

He called for more dialogue between the two parties to exchange ideas and find solutions which are feasible to the African situation.

Participants to the seminar came from Somalia, Ethiopia, Kenya, Tanzania, Zimbabwe, Zambia, Botswana, Lesotho, Uganda and Germany.

## Lusaka leads

By Times Reporter

LUSAKA Urban district council will launch the first independent private water company in Zambia.

Senior governor Cde Rupiah Banda announced this yesterday when he officiated at the opening of the international seminar on the operation and maintenance of urban water supply systems at Hotel Inter-Continental.

He did not specify when the project would take off but said it was being funded with the help of the Federal Republic of Germany.

The seminar is being attended by participants from Zimbabwe, Zambia, Botswana, Lesotho, Uganda, Ethiopia, Somalia, Kenya, Tanzania and Germany.

TIMES

DAILY MAIL

TUESDAY 9TH MAY

## WATER FIRM GETS FUNDS

By Times Reporter

THE Lusaka Water and Sewerage Company is to receive more than \$60 million and 25 million European Community unit of currency in aid support for various projects to be undertaken in the district.

Providing the money will be the African Development Bank (ADB), West Germany, Japan and Italy, Danish aid (Danida) and the United States department of commerce.

The disclosure is contained in a report presented by the Lusaka water project team to the on-going international seminar on operation and maintenance of urban water supply schemes at the Inter-Continental hotel in Lusaka.

The ADB is to fund rehabilitation phase one costing \$36 million. This is the third largest loan ever given to Zambia by the ADB and the project is expected to last four years.

Emphasis will be placed in the 'metropolitan' area of Lusaka.

Lusaka Urban senior governor Cde Rupiah Banda has confirmed the autonomous company, already registered, will be operational this year.

West Germany will channel its assistance through the German technical agency for international aid.

The project will be concerned with the organisational development of the water services department and the company.

Seven experts were seconded to the water services department and included the director and the deputy assistant director of finance.

A condition of the project is the formation of a fully autonomous company to operate the water and sewerage works serving the city. It is an on-going project and \$12 million has already been spent.

The government of Japan has given a grant for the rehabilitation of the Kafue water treatment plant and high lifting pump stations at Kafue and Chilanga.

The first two phases of the project were completed on March 31 costing \$12 million.

A request has been made to the Italian government to fund the rehabilitation of the roadside borehole group — the pumping main serving the Matero reservoirs.

Emphasis will be placed on the Matero and industrial service area and includes a component for sanitary services.

The first phase is expected to cost \$30 million.

Danida is expected to approve a project to upgrade water supplies serving the peri-urban areas of Lusaka while a report has been prepared for the US department of commerce to investigate the environmental impact of the sewage effluent discharged into the Kafue river.

The project will be undertaken this year and will cost \$500,000.

TIMES

WEDNESDAY 10TH MAY

## *Water sector's future bleak, says expert*

By Mail Reporter

ZAMBIA'S water and sanitation sector, now unable to meet national requirements, will deteriorate further unless a national body free of government control is established to oversee it, an expert in the Ministry of Water, Lands and Natural Resources warned in Lusaka yesterday.

Advisor for the International Drinking Water Supply and Sanitation Decade in the Department of Water Affairs, Dr. Inyambo Nyumbu told the international seminar on water at Inter-Continental Hotel that the sector had been rendered ineffectual by "a multiplicity of organisations sharing responsibility for the provision of water and sanitation services throughout the country.

"The responsibilities for the operation and maintenance of water supply

facilities are not clearly agreed upon by the district councils and the Department of Water Affairs," Dr. Nyumbu said, adding that the various organisations had no clear definition of their responsibilities, authority and accountability.

He noted that since most of these organisations were run by local or central government, they were subject to the bureaucracies of the civil service and did not reflect need for financial viability.

The organisations also lacked motivation and direct control over revenue and personnel.

Dr Nyumbu said the solution lay in establishing a national body free to operate "outside the day to day control of government."

"Institutional reorganisation of the sector is vital in order to improve the efficiency and effectiveness of the sector. The implementation of a reorganised sector await a final decision by government."

DAILY MAIL

TUESDAY 14th MAY

## Water sector below par

By Times Reporter

ZAMBIA's water and sanitation services are inadequate and there is need to seriously restructure the water sector.

Advisor for the international drinking and water supply decade in the department of water affairs Dr Inyambo Nyumbu said this in a paper he presented to the on-going international seminar on operation and maintenance of urban water supply schemes at the Hotel Inter-Continental in Lusaka.

The paper entitled "Strategies for the implementation of institutional reorganisation of the water

and sanitation sector in Zambia" says the poor water and sanitation services in Zambia are obvious.

"In the urban centres, shortages of supply, low water pressure, and poor water quality are frequent consumer complaints," he said.

Cde Nyumbu said the situation was worse in rural areas where consumers were scattered in small villages, less formally organised, and outside the watchful eyes of the news media, forcing them to resort to traditional sources of doubtful quality.

The shortage of funds

and poor financial performance by the operating water institutions, was a major constraint to effective and efficient provision of water and sanitation services in Zambia.

Others are, lack of experienced and qualified manpower and legislative and organisational weakness coupled with lack of technical capacity.

"The sector therefore needs institutional restructuring to meet the present and future challenge of providing safe water supply and adequate sanitation for the people of Zambia," Cde Nyumbu said.

TIMES

THURSDAY 11TH MAY



## OPINION

THE past four years have witnessed a fundamental shift in the structure of enterprises in Zambia. By and large the Government has tended to prefer forming autonomous bodies or cede some shares to the private sector.

The rationale has been to improve efficiency while easing the burden on the Government budget. In the event some people have interpreted these measures to imply the triumph of market economics over centrally-planned economic arrangements.

Consequently, capitalist ethos seem to be the central philosophy in most of these emergent firms. The so-called forces of demand and supply are the sole arbiters of price levels. The result has been the marginalisation and outright pauperisation of large sectors of our people.

Shortly the nation will witness the launching of the Lusaka Water and Sewage Company. As we understand it, the company will be a private one providing water and sewage services to metropolitan Lusaka.

The company is being set up with huge loans from the African Development Bank, the Federal Republic of Germany, Italy, the United States and Japan. These countries, obviously, will want their money back some day.

That means the new company will have to be profitable and viable from scratch. In short, it will have to impose more "economical" water and sewage tariffs on users. Given the monopoly which will be enjoyed by this company, it is tempting to stretch the definition of "economical tariffs" to cover all sorts of inefficiencies.

We urge the authorities at the new water company to consider socio-economic realities and particularly the consumer's ability to pay before fixing tariffs. Tariff rates must be weighed against other services contending for the worker's pocket.

The tendency so far has been for companies to pass the effects of their lack of forward planning and ineffective cash management systems on to the consumer. This is immoral.

As a pilot project the performance of the Lusaka Water and Sewage Company will determine the direction this sector will take in future.

The company must therefore not only ensure the uninterrupted flow of safe water in the city, but also make this water available cheaply. After all, water is life.

The observations by an expert that the water sector in the nation is below standard must be taken very seriously by not only the Lusaka council but by every district council.

## 7. List of Participants

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Mr. Seetella Ntšibo Makhetha	Senior Engineer Water and Sewerage Branch P.O. Box 426 Maseru 100 / LESOTHO
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Mr. Obonetse Alfred Masedi	Senior Water Engineer Department of Water Affairs P/Bag 0029 Gaborone / BOTSWANA
Mr. Roy Abel Katse	Chief Technical Officer Department of Water Affairs P/Bag 0029 Gaborone / BOTSWANA
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Mr. Peter Mukhoma Kongoti	Urban Planner (Water Supply Sector) KENYA
Mr. Stanley Kinuthia Kamau	Civil Engineer (Water Supply Sector) KENYA
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Mr. Rabson Mutale Assistant City Engineer  
Ndola Urban District Council  
Ndola, Copperbelt Province  
ZAMBIA

Mr. Michael Mumba Mkozomba Health Assistant, in charge of  
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P.O. Kaoma, Western Province  
ZAMBIA

Mr. Terence Chanda Waterworks Superintendent  
Mansa District Council  
P.O. Mansa, Luapula Province  
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Mr. Jose Masauko	Livingstone Waterworks Supt. P.O. Box 60029 Livingstone ZAMBIA
Mr. Emmanuel R.M. Kambole	Deputy Council Engineer Kabwe Urban District Council P.O. Box 80424 Kabwe, Central Province ZAMBIA
Mr. Wilbroad Bwalya Mwamba	Engineering Assistant Lusaka Urban District Council P.O. Box 30077 Lusaka / ZAMBIA
Mr. Gipson Mukunta	Act. Head of Dep. Maintenance Fitter Industrial Training Centre P.O. Box 34785 Lusaka / ZAMBIA
Mr. Rudolf Ebrecht	Advisor Mechanical Department Industrial Training Centre P.O. Box 34785 Lusaka / ZAMBIA

**8. List of Officials, Lecturers, Partners and Observers of the Seminar**

Mr. Rupiah B. Banda, MP	The Senior District Governor Lusaka / ZAMBIA
Dr. Klaus Timmermann	Ambassador of the Federal Republic of Germany Lusaka / ZAMBIA
Mr. N.J. Mapala	District Executive Secretary Lusaka Urban District Council Lusaka / ZAMBIA
Mr. Jeffrey E. Hendrich	Director of Water Services Lusaka Urban District Council Water and Sewerage Company Lusaka / ZAMBIA
Mr. Ernest G.K. Nyirenda	Counterpart Director Lusaka Urban District Council Water and Sewerage Company Lusaka / ZAMBIA
Mr. D. Kane	Assistant Director Manpower Training Lusaka Urban District Council Water and Sewerage Company Lusaka / ZAMBIA
Mr. Taw Gondwe	Acting Assistant Director Manpower Training Lusaka Urban District Council Water and Sewerage Company Lusaka / ZAMBIA
Dipl.-Ing. G. Fischer	Water Distribution Advisor Lusaka Urban District Council Water and Sewerage Company Lusaka / ZAMBIA
Dipl.-Ing. Bernard Shawa	Water Distribution Engineer Lusaka Urban District Council Water and Sewerage Company Lusaka / ZAMBIA
Dipl.-Ing. B. Lapre	Waterworks Advisor Lusaka Urban District Council Water and Sewerage Company Lusaka / ZAMBIA

Mr. J. B. Sichela	Acting Section Head Lusaka Waterworks Lusaka Urban District Council Water and Sewerage Company Lusaka / ZAMBIA
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Mrs. Priscilla Nsama Okeowo	Senior Biochemist Lusaka Urban District Council Water and Sewerage Company Lusaka / ZAMBIA
Mr. H. Sampa	Biochemist Lusaka Urban District Council Water and Sewerage Company Lusaka / ZAMBIA
Mr. Jealous Godwin Mumbalupeke	Lusaka Urban District Council Water and Sewerage Company Lusaka / ZAMBIA
Mr. M.Y. Sinkolongo	The Development Secretary Development Secretary's Dept. Lusaka Urban District Council Lusaka / ZAMBIA
Mr. J. Chisala	Deputy City Engineer Development Secretary's Dept. Lusaka Urban District Council Lusaka / ZAMBIA
Mr. Herrington L.Y. Zimba	Assistant City Engineer Development Secretary's Dept. Lusaka Urban District Council Lusaka / ZAMBIA
Mr. C.R. Kayombo	The Director of Water Affairs Ministry of Lands, Water and Natural Resources Lusaka / ZAMBIA
Mr. R.J. Mbumwae	The Deputy Director of Water Affairs Ministry of Lands, Water and Natural Resources Lusaka / ZAMBIA

Mr. Kuehn	Advisor to the Director of Water Affairs Ministry of Lands, Water and Natural Resources Lusaka / ZAMBIA
Mr. Erhard Schulte	Advisor to the Director of Water Affairs Ministry of Lands, Water and Natural Resources Lusaka / ZAMBIA
Mr. Adam Hussen	Department of Water Affairs Ministry of Lands, Water and Natural Resources Lusaka / ZAMBIA
Mrs. Chungu Maureen Nsomi	Senior Biochemist Ministry of Lands, Water and Natural Resources Lusaka / ZAMBIA
Mr. Bhawani Dass Arora	Senior Engineer Ministry of Transport, Power and Communications Lusaka / ZAMBIA
Mr. Bornwell Nyekele	Water Engineer Ministry of Transport, Power and Communications Lusaka / ZAMBIA
Mrs. G. Neumann-Gensch	Head of Office Project Administration Service German Agency for Technical Cooperation (GTZ) Lusaka / ZAMBIA
Mr. R. Iyengar	Administrator Project Administration Service German Agency for Technical Cooperation (GTZ) Lusaka / ZAMBIA
Dr. Muleya	Head of Water Quality Control National Council for Scientific Research (NCSR) Lusaka / ZAMBIA
Dr. Inyambo Liyambila Nyumbu	Advisor International Drinking Water Supply and Sanitation Programme - Zambia Lusaka / ZAMBIA

Mr. Jowitt Lameck Kaluwa	Regional Representative Consultant Brian Colhoun Partners Lusaka / ZAMBIA
Mr. Patrick Ngulube, B.Sc.	Regional Representative Pan African Consulting Engineers Lusaka / ZAMBIA
Mr. Willie Chiputu Shawa	Senior Engineer ASCO - Consultant Lusaka / ZAMBIA
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Dr.-Ing. Wolfram Hirner	Managing Director EWAG - Energie- und Wasser- versorgung AG Hochhaus am Plärrer 8500 Nürnberg 80 Federal Republic of Germany
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Dr.-Ing. Wolfram Dirksen	Managing Director German Centre for International Training in Water and Waste Management (DZWA) Gluckstr. 2 5300 Bonn 1 Federal Republic of Germany
Dr. Ulrich Reicherter	Chemist, Head of Laboratory Stadtwerke Essen AG Rüttenscheider Str. 27-37 4300 Essen 1 Federal Republic of Germany
Mr. Koffi N'Dri	General Secretary of the Union of African Water Suppliers (UADE) Abidjan / IVORY COAST



## **9. Evaluation of Questionnaires**

At the end of the seminar, questionnaires were handed out to the participants. The evaluation showed that 3/4 of participants found all parts of the seminar good or excellent. It should be pointed out that everybody, without exception, rated the lectures as being good or excellent; this also refers to the films presented (exception: one participant from Zambia). Some of the participants suggested "Financial Management" as an appropriate additional subject.

Although sufficient time was scheduled for discussions, about 1/3 of the participants would have liked even more, especially with regard to having more opportunity for discussions in smaller groups. However, it was recognized that this would require a longer duration of the actual seminar.

In case of an international seminar with participants from 9 countries the problem arises that some countries think that their special difficulties and experiences are not sufficiently represented. Quite a few representatives suggested that, in a seminar of such international character, the participants from abroad should receive more opportunity to present their own experiences either verbally or in written form.

On the whole, the seminar can be regarded as a full success, even though there is still room for small improvements. All participants will pass on the received information and new technical knowledge to their colleagues and would recommend the attendance of such a seminar. There was also unanimity that the transfer of experiences with the organizers should be continued and that the contact should be maintained.

## 7. List of Certificates

Mr. Lehlohonolo Pelepele	Maseru / LESOTHO
Mr. Seetella Ntsibo Makhetha	Maseru / LESOTHO
Mr. Seele Ookeditse	Gaborone / BOTSWANA
Mr. Obonetse Alfred Masedi	Gaborone / BOTSWANA
Mr. Roy Abel Katse	Gaborone / BOTSWANA
Mr. Karanja Njui	Nairobi / KENYA
Mr. Richard Wasolo Chengoli	Nairobi / KENYA
Mr. Peter Mukhoma Kongoti	KENYA
Mr. Stanley Kinuthia Kamau	KENYA
Mr. Joseph Jjuuko	Kampala / UGANDA
Mr. Patrick Peter Anukur	Kampala / UGANDA
Mr. Christopher Magwenzi Zobgo	Harare / ZIMBABWE
Mr. Peter Ntoyiwa Sibanda	Bulawayo / ZIMBABWE
Mr. Taye Tadesse	Addis Ababa / ETHIOPIA
Mr. Getachew Tamrat	Addis Ababa / ETHIOPIA
Mr. Brown Timothy Mwakabumbila	Daressalam / TANSANIA
Mr. David M. Mihambo	Daressalam / TANSANIA
Mr. Rabson Mutale	ZAMBIA
Mr. Michael Mumba Mkozomba	ZAMBIA
Mr. Terence Chanda	ZAMBIA
Mr. Jose Masauko	ZAMBIA
Mr. Emmanuel R.M. Kambole	ZAMBIA
Mr. Wilbroad Bwalya Mwamba	Lusaka / ZAMBIA
Mr. Gipson Mukunta	Lusaka / ZAMBIA
Mr. Ernest G.K. Nyirenda	Lusaka / ZAMBIA
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Mr. Herrington L.Y. Zimba	Lusaka / ZAMBIA
Mr. Erhard Schulte	Lusaka / ZAMBIA
Mr. Bhawani Dass Arora	Lusaka / ZAMBIA
Mr. Bornwell Nyekele	Lusaka / ZAMBIA
Dr. Inyambo Liyambila Nyumbu	Lusaka / ZAMBIA
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Mr. Patrick Ngulube, B.Sc.	Lusaka / ZAMBIA
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Mr. Adam Hussen	Lusaka / ZAMBIA
Mrs. Chungu Maureen Nsomi	Lusaka / ZAMBIA
Mr. N'Dri Koffi	Abidjan / IVORY COAST