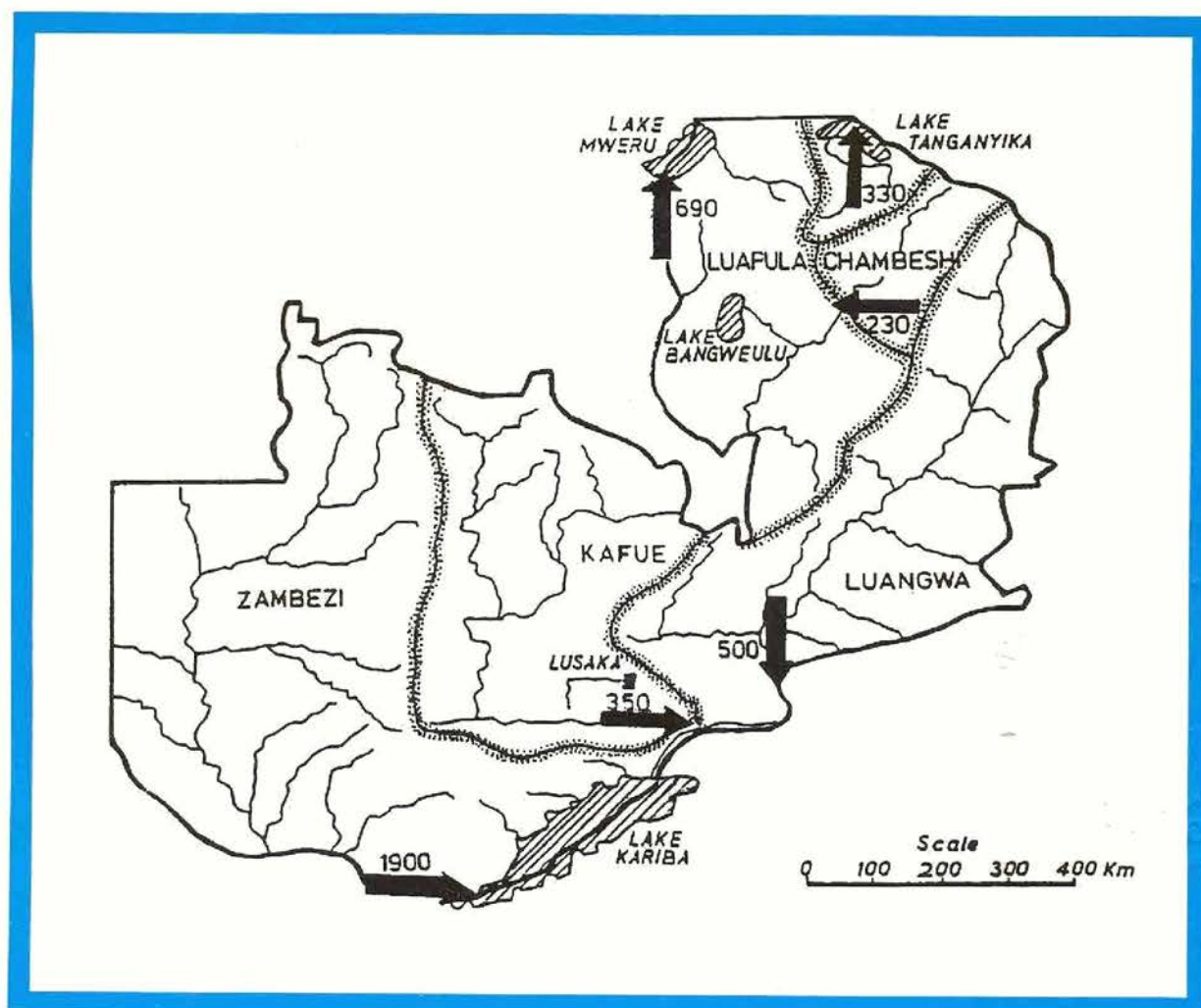




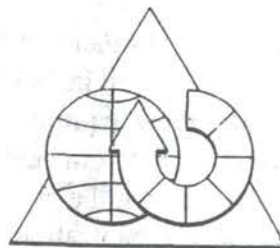
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WATER RESOURCES DEVELOPMENT AND VECTOR-BORNE DISEASES IN ZAMBIA



*Report of a National Seminar
Kafue Gorge, 6-10 November 1995
PEEM Secretariat
World Health Organization
Geneva, 1995*

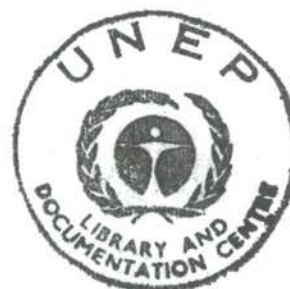
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**WHO/FAO/UNEP/UNCHS
PANEL OF EXPERTS ON ENVIRONMENTAL
MANAGEMENT FOR VECTOR CONTROL**

**WATER RESOURCES DEVELOPMENT
AND VECTOR-BORNE DISEASES IN ZAMBIA**

**REPORT OF A NATIONAL SEMINAR,
KAFUE GORGE, ZAMBIA 6-10 NOVEMBER 1995**



**PEEM SECRETARIAT
World Health Organization
Geneva, 1996**

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About PEEM

The joint WHO/FAO/UNEP/UNCHS Panel of Experts on Environmental Management for Vector Control (PEEM) was established in 1981 to create a framework for inter-agency and inter-institutional collaboration with a view to promoting the extensive use of environmental management for disease vector control as a health safeguard in the context of land and water resources development projects and for the promotion of health through agricultural, environmental, human settlement, urbanization and health programmes and projects. The collaboration originates from memoranda of understanding between three agencies (WHO, FAO and UNEP) covering the areas of prevention and control of water-borne and water-associated diseases in agricultural development, rural water supply and waste water use in agriculture, forestry and aquaculture. In 1991 the three agencies were joined by UNCHS and PEEM's mandate was expanded accordingly to include human settlements, urbanization and urban environmental management including urban water supply, sanitation, drainage and solid waste disposal. The current Medium-term Programme of the Panel covers the period 1991-1995 and contains activities under three headings: promotion, policy modification and technical cooperation; research and development; and training of various target groups.

Among the promotional activities of PEEM are short national seminars for policy and decision makers. The seminar reported on here was the third of its kind; previous seminars were held in Kisumu, Kenya (1988) and Cotonou, Benin (1993) and reports of these can be obtained from the PEEM Secretariat. The Secretariat of the Panel is located at WHO headquarters in Geneva, Switzerland.



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SUMMARY

A National Seminar on Water Resources Development and Vector-borne Diseases was held at the Regional Training Centre, Kafue Gorge, Zambia from 6 to 10 November 1995 as part of the programme of work of the joint WHO/FAO/UNEP/UNCHS Panel of Experts on Environmental Management for Vector Control (PEEM). There were 17 participants from eleven national ministries and bodies and the Zambezi River Authority. The ministries presented papers on their perspective of incorporating human health safeguards into water resources development projects. The results of a health impact assessment study in Zambia was also presented. A sugarcane irrigation scheme was visited and assessed in terms of the health risks it presents. Recommendations of three working groups on policy, institutional arrangement and capacity building in Zambia were subsequently discussed and adopted at a plenary session.

The participants had a clear understanding of the need for personal and corporate efforts at promoting the ideas generated in their various ministries and bodies. In this connection the local organizing committee which was established for the seminar's organization was to continue as a steering group to look after the implementation of the seminar's recommendation.

Zambia has developed a National Environmental Action Plan, a National Water Policy, a National Water Resources Plan (with a Board to administer development) and a new Health Policy emphasizing disease prevention. Thus, the country has all the necessary ingredients for the development of a national strategy on health and environment which would provide the institutional framework for closer collaboration between the various line ministries and the health and environment authorities. This provides the basis for a strong WHO/FAO collaboration to promote this collaboration in Zambia.

In the present document, the recommendations of this seminar are presented, followed by detailed seminar proceedings and unabridged versions of the papers presented.

ABBREVIATIONS

ASIP	Agricultural Sector Investment Programme
BOZ	Bank of Zambia
ECZ	Environmental Council of Zambia
ESP	Environmental Support Programme
FAO	Food and Agriculture Organization of the United Nations
MAFF	Ministry of Food and Fisheries
MEWD	Ministry of Energy and Water Development
MEWR	Ministry of Environment and Natural Resources
MLGH	Ministry of Local Government and Housing
MOF	Ministry of Finance
MOH	Ministry of Health
MWS	Ministry of Works and Supply
NCDP	National Commission for Development Planning
NCS	National Conservation Strategy
NEAP	National Environmental Action Plan
NGO	Non-governmental Organization
NOC	National Organizing Committee
PEEM	WHO/FAO/UNEP/UNCHS Panel of Experts on Environmental Management for Vector Control
PIP	Public Investment Programme
UNDP	United Nations Development Programme

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RECOMMENDATIONS

The following recommendations were adopted by the participants of the seminar, following the presentation of the conclusions of three working groups on policy, institutional arrangements and capacity building.

POLICY

Policies relating to Environmental Impact Assessment should ensure the inclusion of Health Impact Assessment as a cross-cutting component with due reference to a key role for the Ministry of Health.

The harmonization of existing policies (National Water Policy, National Health Policy, Environmental Policy), as well as new or reformed policies in relevant areas should continue to be undertaken by the National Commission for Development Planning (NCDP).

The possibility should be explored for the Zambian authorities to work with WHO in an initiative to formulate a national "Health and Environment" strategy to complement and support the National Environmental Action Plan.

Several of the ingredients of the National Health Policy (PHC in development projects, monitoring health status during construction and operation, the new concept of environmental health) should be given a significantly higher profile in programming.

General government policy to promote intersectoral collaboration should be strengthened.

INSTITUTIONAL ARRANGEMENTS

Issues of health impact, assessment appraisal and monitoring of health status in development should be included in the terms of reference pertaining to the new Water Resources Board.

The composition of the new Water Resources Board should reflect the sectoral interests in the human health aspects of water resources development.

The functions of the Water Resources Board in this context should include:

- ❖ Reviewing initial health impact assessment
- ❖ Preparing terms of reference for a full health impact assessment
- ❖ Appraisal assessment report
- ❖ Monitoring health status in development
- ❖ Costing and promoting environmental management measures.

CAPACITY BUILDING

Ministries should develop, in a coordinated manner, proposals for capacity building in the area of health and environment and development.

The possibility for the organization of a training course "Health opportunities in water resources development" in Zambia should be explored.

The following recommendations were made to promote corporate and individual efforts by participants:

The National organizing committee should be maintained as a steering and coordinating group.

All participants should actively follow up recommendations with their own ministries.

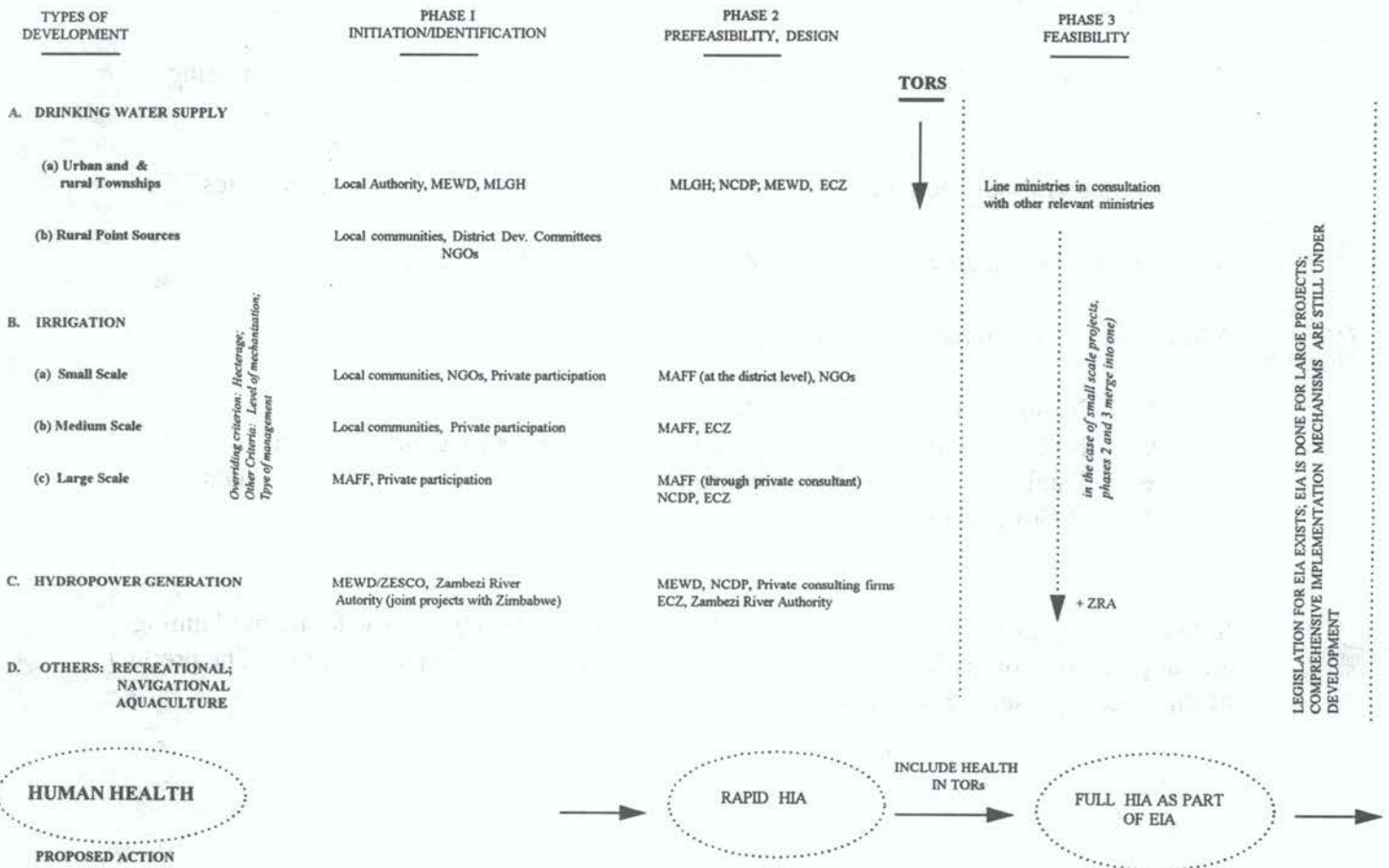
A follow up seminar should be held in Zambia in 12 months to review progress.

Activities to be given particular priority are:

- ❖ National Health and Environment Strategy.
- ❖ Follow-up of to Health Impact assessment of the irrigation project.
- ❖ Establishment of the Water Resources Board with an expanded mandate.
- ❖ Policy review.

In two working groups a flowchart was prepared of water resources development planning and implementation in Zambia, and this was consolidated in a plenary session. The product of this task is presented on the next pages.

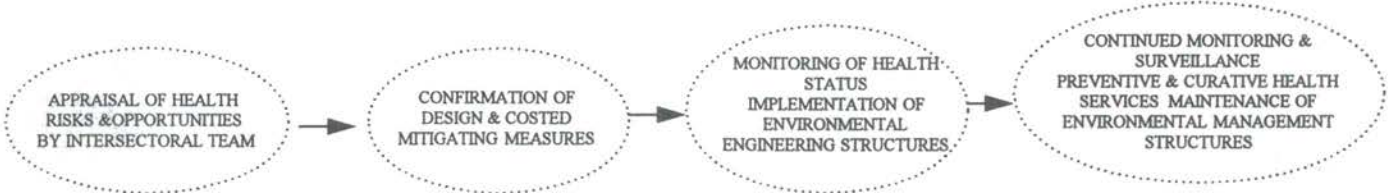
PUBLIC SECTOR PLANNING PROCEDURES FOR DIFFERENT



Overriding criterion: Hectareage;
 Other Criteria: Level of mechanization;
 Type of management

CATEGORIES OF WATER RESOURCES IN ZAMBIA

<u>PHASE 4 APPRAISAL</u>	<u>PHASE 5 NEGOTIATIONS</u>	<u>PHASE 6 CONSTRUCTION</u>	<u>PHASE 7 OPERATION & MAINTENANCE</u>
Line ministries NCDP, ECZ	(1) MOF, Line ministries, NCDP, DBZ	MLGH; (Private)	MLGH, MEWD, Local authorities with other relevant ministria
	as in (1) above	MLGH, NGOs, Donors, MEWD	Local communities, District Dev. Councils
	NGOs, Banks	MAFF, NGOs Donors, Local communities	<i>Beneficiaries</i>
	as in (1) above	MAFF, MEWD (private)	MEWD, MAFF, Beneficiaries
	as in (1) above	MAFF, MEWD (private)	MEWD, MAFF, Beneficiaries
	as in (1) above + ZRA	ZESCO, Private firms	ZESCO, Donors (Temporary)



INTRODUCTION

A National Seminar on Water Resources Development and Vector-borne Diseases was held at the Regional Training Centre, Kafue Gorge Zambia, from 6 to 10 November 1995. Seventeen participants from eleven national ministries and bodies and the Zambezi River authority (a bilateral agency of Zambia and Zimbabwe) attended. A list of participants is presented in annex 1.

The seminar was planned in March 1995, during a visit of the Executive Secretary of PEEM to Zambia. A national organizing committee was established to take care of the preparations. Four ministries (Health, Agriculture, Food and Fisheries, Energy and Water Resources, and Environment and Natural Resources) took part in this committee, which received support from the local representations of WHO and FAO. The committee was coordinated by Mr. Chisanga, Chief Health Inspector of the MOH. In addition, the Department of Public Health of the Agricultural University of Wageningen, the Netherlands, contributed the services of an M.Sc. student, who assisted the national organizing committee and coordinated a health impact assessment of the Buleya Malima Irrigation Scheme.

The results of the assessment were presented at the seminar and highlighted not only the findings but also the assessment procedures followed and constraints that were encountered during the intersectoral exercise.

A programme was developed by the national organizing committee (see annex 2) and participating ministries were invited to prepare working papers

The Kafue Gorge was selected as the Venue for this seminar because it provides easy access to the Kaleya Small-holders Irrigation Scheme, where a one-day field visit was made. The opening of the seminar took place in Lusaka, on 6 November.

OBJECTIVES , ACTIVITIES, EXPECTED OUTPUTS

The Seminar had the following objectives:

- ❖ to increase awareness among high level national policy and decision-makers about the environmental/health implications of water resources development in Zambia;
- ❖ to develop a consensus basis for the reform of sectoral policies in order to ensure that human health issues associated with water resources development are considered at crucial points during the project cycle. Such reform will allow for the incorporation of health safeguards into such projects in support of their sustainability;
- ❖ to strengthen existing institutional arrangements and to design mechanisms that achieve optimal compliance with these arrangements, so as to ensure that an effective intersectoral dialogue is maintained during project planning, development and operation.

- ❖ to set priorities for capacity building activities that will support and enable the opportunities of policy reform and strengthened institutional arrangements to be utilized with maximum benefit.

ACTIVITIES

The following activities were carried out by the seminar in order to achieve the above objectives:

- to review the national and sectoral development policies concerning water resources development and management, environment and health, and the national and sectoral strategies to meet the policy goals. These include in particular the national water policy, the national Master Plan for Water Resources Development, the National Environmental Action Plan and health policies relating to vector- and water-borne disease prevention and control;
- to review regulations and legislation concerning Environmental Impact Assessment procedures in water resources development and the position of health therein;
- to prepare an updated flowchart of all steps within the project cycle of all the main categories of water resources development in Zambia and the ministry/authority responsible for each step as well as to indicate the need and the potential for health impact assessment and the stage(s) where it should occur.
- to formulate options for harmonizing standards related to environmental and health indicators which show discrepancies as a result of recent new legislation;
- to review existing institutional arrangements and options to improve and strengthen the intersectoral dialogue in the planning, development and management of water resources;
- to identify current deficiencies in the capacity of the national authorities to deal with these issues and to set priorities in capacity building activities to overcome these.

EXPECTED OUTPUTS

- An updated flowchart of water resources planning and development in Zambia;
 - updated information on the national water policies and strategies;
 - updated information on the health status of rural populations as affected by water projects;
 - updated information concerning policies, procedures and legislation for Environmental Impact Assessment and the status of the National Environmental Action Plan (NEAP).
- A report containing the above information and recommendations on:
- ❖ options for national and sectoral policy reform,

- ❖ improved institutional arrangements mechanisms for the harmonization of standards strengthening the position of health in EIA and the NEAP,
- ❖ options and priorities for capacity building.

OPENING SESSION

The seminar was opened by the Honourable Minister of Energy and Water Resources, Mrs. E. Nawakwi following statements by the WHO and FAO representatives.

Representing the Director-General of WHO and the Regional Director of WHO for Africa, Dr. W.S. Boayue, WHO Representative in Zambia, stated that, following the United Nations Conference on Environment and Development, WHO had undertaken major efforts to ensure that human health be clearly apparent and receive due attention in the process of policy reform and institutional change. The current Strategy on Health and Environment was therefore aimed at assisting Governments of Member States to ensure that in the development of new policies and programmes aimed at environmental assessment and protection in the context of development, health was considered as a cross-cutting issue transcending the sectoral concerns of the health ministries. The increased incidence of water-related diseases, as governments accelerated the development of water resources in support of food security and energy in the face of continued drought in the southern African region, underscored the importance of health risk assessments and an intersectoral approach to issues of health in the development projects in the region.

The FAO representative in Zambia delivered a statement on behalf of the Director-General of FAO. Following the droughts of the 1980s and early 1990s, Zambia had experienced a significant upsurge in commercial and semi-parastatal irrigation projects, with about 46 400 hectares of land irrigated by 1991. However, there were as yet no appropriate governmental policies and strategies for the enhancement of the sub-sector. He emphasized the need for health protection in irrigation developments as the sub-sector plays an increasing role in the national objective of achieving food security.

The Honourable Minister of Water and Energy noted, with satisfaction, the broad-based multi-sectoral representation of the seminar participants, indicating the importance of the inclusion of all relevant groups in the development and management of the country's water resources. With the continued drought and a currently only 25% of the population having access to potable water, Zambia faces a serious challenge in water resource management with an emphasis on resource conservation. Cognisant of the link between reservoir creation and water-related diseases, she emphasized that a good balance needed to be achieved between sustainable water resources development and good public health. She therefore advocated a well coordinated community-based management programme in the country involving all relevant line ministries which should be backed by adequate national capacity and policies.

To conclude the opening session, two videos were shown: *Our Common Future* and *Disease and Development, a critical connection*.

WORKSHOP DISCUSSIONS

The following are the highlights of the seminar discussions

FLOWCHART DEVELOPMENT

The first day of the seminar started with presentations by WHO and FAO, which provided the international policy framework for the subject of the seminar. The participants then worked in two groups on a task aimed at preparing a comprehensive flowchart of water resources development planning projects in the country. The flowchart, which was consolidated at a plenary session the next day is presented on pages 8 and 9 of this report.

The major categories of water development are domestic water supply, irrigation and hydropower generation. With the current government policy of decentralisation, local authorities, District Development Committees and Non-Governmental Organisation are the major initiators of rural township and point source potable water development as well as of small to medium scale irrigation projects. The Environmental Council of Zambia is responsible for the environmental impact assessments of all development projects in the country. The first level of assessment for such projects is, however, often carried out by the District Development Committees which have representation from the various line ministries including health. The line ministries are mainly involved in implementation. Project appraisals and the operation and maintenance of water development projects may involve either the relevant line ministry, local authority/development councils or donors, depending on the nature of the project.

The National Council for Development Planning presently coordinates and approves development projects at the national level. The Project Investments Department of the Council receives and assesses projects and has to give its approval of recommended funding. The Council solicits and mobilizes external funds for development projects, which at present constitutes about 70% of total funding of such projects. It is the Government's intention, however, to reduce current high dependency on external funding by increasing internal funding component of such projects to 75%.

WATER RESOURCES DEVELOPMENT AND MANAGEMENT

A greater proportion of the population (about 80-85%) are without access to potable water. Current efforts to supply communities in the arid areas with potable water has led to the proliferation of boreholes. The danger exist that the current high level of ground water abstraction could exhaust the aquifers in some areas. Though there is a considerable amount of surface water in the river systems in the country, the financial investment needed for its distribution for domestic use is a major limitation to utilization.

The Government has set up a Water Board which administers the allocation of water rights for development projects. The Board's work is, however, constrained by a paucity of hydrological data, especially on ground water. A Water Resources Board is in the process of

being established. The formation of the Board has received in-principle government approval. Its terms of reference are, however, yet to be developed. Thus, the full extent of the Water Resources Board's intended activities remains to be defined.

The management of water resources in the country is to be transferred to the Ministry of Energy and Water Development so as to enhance effectiveness. Meanwhile, domestic water supply is to be transferred to the Ministry of Local Government to facilitate the development of community driven schemes.

Zambia has developed a National Water Policy and in line with that, the country has recently developed a National Water Resources Master Plan with Japanese support.

HEALTH ISSUES

Malaria is the number one health problem of the country (354 cases/1000 population in 1992) followed by schistosomiasis (mean prevalence of 17 cases per 1000 population). A new National Health Policy has been developed which puts emphasis on disease prevention. Specific goals include ensuring safe physical environments and health supportive habitats. A Public Health Act and Mosquito Examination Act are two cardinal pieces of legislation under the new health policy, associated with water resource development and management.

The NCDP estimates that the country spends US\$7 on health care per person each year and this is considered too high for the country. Thus, there is a serious determination on the part of government to reduce current expenditure through increased public health promotion.

Zambia has also developed a National Environmental Action Plan. Under a new Environmental Protection and Pollution Control Act (ECPPCA) environmental assessment is mandatory for all development projects. In spite of these efforts, however, the various environmental laws are at present fragmented, sector-biased and sometimes contradictory. Thus there is the need for a review of all existing laws with the view to harmonizing it with the ECPPCA.

WORKING GROUP REPORTS AND CONCLUSIONS

The participants, working in three groups on policy review, institutional arrangement and capacity building necessary for effective intersectoral collaboration between the various line ministries came up with the following conclusions:

Policy review

1. There is the need for an integrated forum for water development programmes involving various line ministries and other interested parties before the NCDP approval of projects.
2. The Government should ensure HIAs in the context of EIAs. The HIAs should be cross-cutting rather than sectoral, as part of the EIAs.
3. The health sector should take a leading role in environmental health.

4. There is the need for the harmonization of the health ministry's policies with other development policies.
5. There is the need for the promotion of the concept of "healthy environment" through advocacy and awareness.
6. The Ministry of Health should monitor water development projects after construction.
7. Primary health care (promotional, curative and preventive) should be emphasized in the context of development projects.
8. There is the need for a general policy of intersectoral coordination.

Institutional arrangements

1. There is the need for the formation of an intersectoral coordination regulatory body to coordinate activities between line ministries.
2. There is a need for consultative meetings.
3. There should be a clear definition of institutional responsibilities.
4. Information networking is required. Thus, there is the need for the selection of a contact person in each sector to facilitate the flow of information between the sectors.
5. Appropriate legislation should support institutional arrangements.
6. Co-opting other important key players into the membership of the Water Resources Board is a key issue. The Board's mandate will also have to be expanded to include all water development projects as well as be provided with the necessary legislative instruments to enable its proper functioning. Working teams drawn from ministries and bodies should be set up at the provincial and district level. These provincial and district bodies which should reflect the board's composition at the national level should meet from time to time to deliberate on issues of concern.

At the provincial level these bodies should review and appraise projects and coordinate investments, while the major objective of the district bodies will be to ensure compliance with standards and to facilitate community participation.

Capacity building

The conclusions of this working group followed the envisaged project cycle:

PHASE 1: Adequate planning capacity needed.

PHASE 2: Skills for HIA scoping.

Availability of data on health, water and environment. Needed are:

- ❖ strengthening of the capacity of environmental health inspectors;
- ❖ hydrological measurements, reinstate measuring stations, gage measuring and quality control;
- ❖ extension workers who are trained on issues of health and water resources development and information-gathering community interactions.

The three components of an HIA, that is, community vulnerability, environmental receptivity and health services vigilance should be ensured.

PHASE 3: The planning ministry (Energy and Water Development) must be strengthened in terms of capacity for the analysis and appraisal of assessments and translation into design as well as the skill for additional scoping.

PHASE 4: An intersectoral group should be established to appraise the health risks of development projects and to propose mitigating measures. Such a group should also have the capacity to translate health impacts into economic terms.

PHASE 5: A monitoring group comprising the ministries of Health and Energy and Water Development should oversee the health status of affected communities.

PHASE 6: The Environmental Council of Zambia together with the ministries of Health and Energy and Water Development should ensure continued monitoring

PHASE 7: The Ministry of Health should assume its role in monitoring on a continued basis. In line with this responsibility the will need funding, facilities and the political will as basic capacity building requirements.

FIELD TRIP AND DEBRIEFING

The seminar provided the opportunity for the participants to assess two water resource projects as an intersectoral group: in the morning of the third day a structured programme had been prepared to review the situation at the Kaleya Small-holders Company, an irrigated sugarcane scheme. The three groups from the previous day were maintained and these rotated in inspecting the health centre, one of the settlements, various hydraulic structures in the scheme, harvesting operations, the local school and the scheme management with the extension workers.

In the afternoon, the participants the visited the Kafue Gorge hydroelectric plant, where they were given an extensive guided tour.

The following summarizes observations made by the participants at a subsequent debriefing:

Water management

1. Good aspects

- Structural design for water delivery
- Good health services

2. Aspects that need improvement

- Better drainage maintenance needed
- Night storage provides a schistosomiasis risk

Sanitation

1. Good aspects

- Adequate in the villages
- Adequate provision of drinking water
- Poverty alleviation: malnutrition among the children is lower than the national average.
- Relatively good housing and clean domestic environment
- Siting of settlements away from night storage tanks

2. Aspects needing improvement

- Inadequate sanitation facilities in primary school and sugarcane fields
- No first aid facility at the primary school
- Need for improved hygiene among school children
- Poor water supply to school
- Lack of screening of migrant labour and other human circulation.
- Unplanned settlements overburdening services, especially health.
- Existing occupational hazards, eg. inhaling of dust from "smart-diseased" sugarcane plants.

PAPERS PRESENTED AT THE SEMINAR (UNABRIDGED)

INTERSECTORAL COLLABORATION FOR THE INCORPORATION OF HEALTH SAFEGUARDS INTO DEVELOPMENT PROJECTS

Hans Verhoef and Lucy Clarke

Abstract: The health sector is usually isolated from developments that take place in other sectors. The present paper outlines the rationale for collaboration between the health and the agricultural and water sectors. Using the experiences of other countries, it furthermore provides some ideas on how this collaboration can be achieved and which may serve as a basis for brainstorming sessions on appropriate mechanisms for intersectoral collaboration.

INTRODUCTION

The questions that we will be faced with in this seminar is how government agencies and professionals from various sectors can work together to mitigate the health risks that result from water resources development, in particular the development of irrigation schemes, and how non-governmental organisations (NGOs) and external support agencies (ESAs; multilateral development agencies, banks and funds) can support governments in these efforts.

Governments can influence development through their policies, programmes and projects. Agricultural policies are usually formulated within a macro-economic framework that is broad in nature and which is not likely by health considerations. Adverse health effects that are the general result of development policies should therefore be redressed by an adequate health care delivery system.

Agricultural projects in general, and irrigation projects in particular, commonly result in radical environmental and demographic changes, and consequently in serious health risks. On the other hand, the farming systems in agricultural projects offer a greater potential for health interventions than traditional farming systems:

- (a) projects are planned and usually centrally managed and thus offer opportunities for health sector to get involved in decision-making process;
- (b) health can (and should) be taken up in the economic analyses that form the basis of decision-making of the projects, so that part of the resources that are used for the project should be spent to finance the capital costs and recurrent costs of mitigating measures;
- (c) projects usually aim at the production of cash crops, and farming families may use the resulting increase in purchasing power to buy medicines, mosquito nest, etc;
- (d) the physical environment of farming systems that are created by agricultural development projects are more easily controlled and consequently more amenable to environmental manipulation and modification than that in traditional systems.

The health sector should be closely involved at all stages of planning, implementation and operation of agricultural and water resources development projects. The incorporation of engineering measures into the design, operation and maintenance of agricultural schemes is primarily a responsibility of the agricultural sector, but it requires close consultations with health experts to assess the possible health impact of a project,

¹ This paper is adapted from a paper Hans Verhoef and Lucy Clarke prepared for a national seminar in Benin in 1993. At the time, Hans Verhoef worked as an Associate Professional Officer in the PEEM Secretariat; he is currently attached to the Department of Public Health of Wageningen Agricultural University. Lucy Clarke was attached to the Community Water Supply and Sanitation (now Rural Environmental Health) Unit of WHO and is currently doing course work at the London School of Hygiene and Tropical Medicine.

to get technical advice on appropriate measures and monitor the health status of the temporary labourers and the beneficiaries of the project. Alternatively, mitigating measures may consist of increasing the capacity of the health sector to deliver care to the farmer families at risk. However, the health sector can only respond properly and timely when it is involved from the earliest stages of project planning and when it can share resources with the agricultural and water sectors.

Practice shows few examples where this collaboration between health sector and the other sectors has been achieved. Different sectors have to compete for limited funds and tend to have a self-centered perception of priorities in national programmes. The Ministry of Health (MOH) of most countries is normally isolated from development activities and usually does not have the capacity or the means to participate as an equal partner in negotiations with other sectors. Collaboration is furthermore hampered by differences in operations of the various sectors and different perceptions of time. Diseases create long-term problems that can be controlled but, with few exceptions, can never be eradicated. MOHs therefore commonly work through programmes aimed at long-term control of diseases that are considered to be of major public health importance. In contrast, most other ministries have well-defined goals which are set in an overall macro-economic policy framework. The role of time-limited projects is far greater in other sectors than in the health sector.

Contrary to health projects, agricultural projects can contribute to the income of farmer families or government. Expenditures for health improvements must be financed by income-generating sectors. The savings that are made by limiting the investment of agricultural development projects to increase production or farmer income may later require greater investments by governments to maintain the health status of the beneficiaries of the project at acceptable levels. Consequently, planners should see improvement of health as one of the objectives of an integrated project, and part of the capital investments and the project's revenue should be used to finance the recurrent costs of health care for the farming families concerned.

The remainder of this paper will focus on irrigation projects as the primary targets for intersectoral collaboration: of all agricultural development, they create the greatest health risks and they offer the best opportunities for the incorporation of health safeguards. The opportunities for involvement of the health sector will be discussed for each of the following forms of irrigation development: small-scale schemes, new large-scale schemes, and, schemes which undergo rehabilitation

SMALL-SCALE IRRIGATION SCHEMES

Governments are not usually involved in small-scale irrigation developments and sometimes not even aware of such developments. The only health and engineering expertise likely to be available to small-scale irrigation schemes are provided by the District Health Officer and the District Engineer. They will benefit from the development of guidelines on procedures and standards of minimum requirements in design, operation and maintenance of the scheme. These guidelines and standards should be incorporated in the training of engineers. It must be emphasized that standards must be enforced, and that this is the prime responsibility of the local and national authorities.

Engineering and vector specialists could be asked to teach some of the courses for agricultural extension or health personnel, so that these know the health benefits of environmental management measures. This will enable them, in turn, to teach farmers or school teachers.

In circumstances where small-scale irrigation is organised by a group rather than by individuals, it may be possible to develop model bylaws which groups can be advised to adopt as part of their own constitution or internal rules. For example, washing in canals or neglecting timely weeding may be made punishable by a fine to be imposed by the officers of the irrigation association. Alternatively, village Councils can be advised to adopt such bylaws.

NEW LARGE-SCALE IRRIGATION SCHEMES

Project Cycles

Most projects which require funding by ESAs have a phased planning process which is known as the project cycle (see table at the end of this paper). The health sector should develop a thorough understanding of the procedures that are involved in the planning, implementation and monitoring of agricultural development

projects in order to be able to team up with the other sectors. The table below shows the various phases in the project cycle, the activities that take place during these phases, and the outputs that should be achieved at the end of each phase to ensure that health issues are adequately addressed in the planning process (see Tiffen, 1991 for a more detailed description).

Institutional arrangements for intersectoral collaboration

Intersectoral collaboration tends to be a management of conflicting interests, and the institutional arrangements between sectors must therefore be enforced from the highest level of executive power.

The development of a new irrigation scheme requires negotiations between various ministries, funding agencies and farmer interest groups. The term institutional arrangements refers to the ministries or other government bodies that are involved in the negotiating process and the administrative arrangements and procedures that formalise the contacts between these bodies. Of importance are furthermore the legal authority and the working means to execute the tasks that are allocated to each of the agencies.

Effective institutional arrangements ensure a level of intersectoral collaboration that is appropriate for national requirements. Such arrangements do not generate spontaneously, but they are rather the outcome of trial and experience. Experience in a number of countries has shown two different models for the ways in which different sectors can collaborate and make joint decisions:

1. the establishment of inter-ministerial linkages through Memoranda of Understanding which outline the rationale for collaboration and which state a mutual commitment to reduce adverse effects of development through early detection of potential problems and resource sharing for their prevention and mitigation

It is of crucial importance that the text of the Memoranda of Understanding gives a clear division of labour and the allocation of (donor) funds.

2. The establishment of a special body with elevated executive powers, which can operate in a fully integrated manner either by itself (e.g. an Integrated River Basin Authority) or through existing structures (e.g. Council for Integrated Rural Development or a National Water Council which coordinates activities by other government agencies).

The creation of a national committee is only useful if it is given executive powers and funds to implement its recommendations.

Environmental Impact Assessment (EIA)

Although a high proportion of developing countries has introduced procedures (and also legislation) requiring the operation of environmental impact studies in advance of developments of a significant scale, they often have problems in the implementation of the recommendations of these studies. As a result, EIAs are often not carried out or its recommendations are neglected. The reasons cited include institutional and administrative deficiencies, lack of trained scientific and technical staff, political manipulation and insufficient funds. Some countries have reported EIAs of inadequate quality as a result of lack of trained personnel within government agencies to write up and evaluate the terms of reference (TORs), or within the MOH, local research institutes or consultancy firms, lack of technical expertise to properly carry out EIAs.

Sometimes the value of projects can be significantly enhanced by public health or safety components or even parallel projects. For example, an irrigation project may benefit from the simultaneous provision of domestic water supply and sanitation facilities to prevent or reduce the transmission of schistosomiasis, even if the cost of doing so cannot be justified by the expected reduction of schistosomiasis alone. A more positive approach than an environmental impact assessment would be to use environmental opportunity assessments, which would give a broader mandate to investigate the possibilities of expanding planned projects with components which maximizes the total benefit, or of combining projects which are mutually synergistic.

TABLE : Critical phases during the project cycle (see note below table)

Phase in the project	Major activities	Crucial decisions that will be taken	Recommended actions for safeguarding health	Remarks
Identification	<p>identification of possible projects</p> <p>formulation of terms of reference</p>	<p>site under consideration will be further investigated (or not)</p> <p>prefeasibility study is commission, consulting firms will plan inputs of specialists in these studies on the basis of TORs; site under consideration will be further investigated (or not)</p>	<p>preliminary screening: check with health sector if health problems are likely to occur, decide if a EIA (including health impact assessment) will be done as part of the prefeasibility study</p> <p>terms of reference should specify, among others, that account should be taken of : <ul style="list-style-type: none"> ■ health conditions in project area ■ health conditions in irrigation schemes elsewhere in the region ■ necessary upgrading of water supplies for domestic use and livestock purposes ■ financial arrangements, e.g. whether the funding for health safeguards should come from central ministry revenues or from contributions in payments of work by the beneficiaries, or both </p>	<p>Screening: rapid, in-breadth assessment to identify health risks, based on information that is immediately available</p> <p>routine mechanism for intersectoral planning should have been established in advance</p> <p>if TORs do not mention health aspects, these may never be properly investigated</p>
Preparation	<p>prefeasibility study</p> <p>data collection and analysis</p>	<p>decide on procedure for planning, implementation and operation of the project</p> <p>embark on feasibility study (or not)</p> <p>feasibility studies are commissioned;</p>	<p>review and ensure that sector at all levels of responsibility is prepared to respond adequately and in a timely manner in the planning process</p> <p>forecasting vector-borne disease implications (Birley 1989), preliminary recommendations for mitigating measures and setting terms of reference for health part of feasibility studies</p> <p>collection of local data</p>	<p>prefeasibility studies: outlines various options indentifies knowledge gaps</p> <p>the health impact assessment part of prefeasibility studies is not usually carried out by experts (nor should it be)</p> <p>probably the last time at which it is politically feasible to stop a large project</p> <p>data to be collected: local climatic, demographic, agricultural, health data, etc</p>

TABLE : Critical phases during the project cycle (continued)

Phase in the project	Major activities	Crucial decisions that will be taken	Recommended actions for safeguarding health	Remarks
Preparation (continued)	feasibility studies and design		scoping and bounding (as much as possible quantitatively), detailed recommendations on strategies to mitigate adverse health impacts and ways and means for the implementation of these strategies EIA should minimally give: <ul style="list-style-type: none"> ■ a prediction and approximate quantification of health ■ a costing of environmental and/or alternative measures for minimizing health risk ■ a selection of cost-effective and appropriate design, and recommendations on operation and maintenance systems ■ recommendations on health resources and activities ■ a schedule of the expected influx of the work force into the project area ■ recommendations on the phasing of the project ■ a statement of health monitoring systems, institutional organisations and legal requirements for the recommended project ■ recommendations on the institutional arrangements 	feasibility study: full study of the preferred option scoping: a qualitative or quantitative prediction health impact of project, bounding: predict when where health risks will occur the terms of reference of the feasibility study should leave flexibility so as to should the need arise additional health issues can be studied than foreseen in the prefeasibility stage
Appraisal	appraisal of the feasibility study financial negotiations	project selection adjustment, approval and clearance	review the economic analysis; review ir recommendations of EIA. are consistent with health policies; check if MOH will have resources available for implementation; review institutional arrangements; review if feasibility study is reasonable accord with wishes and capabilities of beneficiaries allocation of funds; preparation of Memoranda of Understanding as recommended, start planning of health and educational measures	appraisal: review of feasibility study by all ministries and agencies concerned and at appropriate levels of responsibility, as well as by External Support Agencies Ensure that provincial and district levels of MOH and representatives of local interest groups are properly consulted!

TABLE : Critical phases during the project cycle (continued)

Phase in the project	Major activities	Crucial decisions that will be taken	Recommended actions for safeguarding health	Remarks
Implementation	detailed design and construction	decisions on lay-out of water courses serving the farms, footbridges, washing facilities, etc	consult beneficiaries in final design stages; monitor and report on compliance with agreed measures, standards and norms; monitor the effectiveness of health measures during construction phase, particularly for imported labourers	
	implementation and monitoring		monitor if recommended management practices are feasible; monitor unforeseen health effects and consult timely with other parties to remediate unforeseen effects	
Integration and handover	integration and hand-over of normal administration		review and report on adequacy of arrangements and resources; arrange for local coordination, information exchange, health education and monitoring when operations are assessed on to local authorities	
Evaluation	reviews by ESA and government if actuality matches up plans		measure changed in health status and capacity of local health services; check cash flows which are needed for proper maintenance of the system	
	follow-up analysis and action		review of operational plans; introduce or adjust legislation if needed	
Operation	maintenance and monitoring		maintenance of the system; monitoring of health status and farmer practices; health education; enforcement of guidelines and standards	

Note: The use of Environmental Impact Assessment (including Health Assessment) is a relatively new phenomenon. Although EIA should remain a flexible process, designed to suit different project sizes and circumstances, it should be kept in mind that procedures may vary considerably according to the agencies involved, and that terminologies are not (yet) standardized, and various agencies may have different definitions for the same terms.

STRATEGIES FOR IRRIGATION DEVELOPMENT IN SOUTHERN AFRICA

with special reference to environmental and health protection

J. Kamphuis and A. Kandiah ¹

INTRODUCTION

To many developing countries, agricultural and rural development remain priority areas of national development. This is particularly true for the African nations, many of which are unable to produce enough food to meet the demands of their growing populations. It is reported that still 800 million people are suffering from hunger today. The alleviation of hunger and malnutrition depends in great part on the improvement of and increase in food production, as well as on ensuring access to adequate, good quality food supplies. Thus, agriculture must be made to produce more and in a sustainable manner, using methods that do not damage the environment and human health.

Since its inception, FAO has pursued the goals of food security and improving the living conditions of rural populations alongside those of conserving natural resources and protecting the environment. A specific priority of the Organization is promotion of sustainable agriculture and rural development, a long term strategy for conservation and management of natural resources. FAO's approach to sustainable agriculture is inspired by considerations of human needs, poverty alleviation and the management of natural resources to meet the needs of present and future generations. Thus, policies and programmes concerning the utilization and conservation of natural resources in general and water resources in particular are important elements of FAO's mandate.

In responding to these challenges, a number of measures are being implemented by the Organization. A very important and relevant activity of FAO in this context is the Special Programme of Food Production for Food security in Low-Income Food-Deficit Countries (LIFDCs), which is to spearhead more coherent and effective action at the major root causes of the food security and the malnutrition problem through a "new green revolution".

In its pursuit to assist Member Nations to achieve food security, the Organization has come to recognize the fundamental role of water, not only in food production but for the overall wellbeing of humanity.

IRRIGATION IN AFRICA

The central role of irrigation in food production and in achieving food security is well-established. Globally, there are now about 235 million hectares of irrigated lands, representing about 17 percent of the total arable area, but production from this small fraction of the land accounts for 35 percent of the total food harvest. Food production and productivity depend greatly on an assured supply of water. The experience of the green revolution in Asia has demonstrated that the increased use of fertilizer and high yielding rice varieties goes hand in hand with assured water supply. Yields per hectare obtained from irrigated cereals are on the average more than twice and often four times higher than from lands that are not irrigated.

A recent study by FAO indicates that the water resources of East and southern Africa amount to about 20% of the total water resources of the Continent. At the same time, the water use (water withdrawal) in these two regions accounts for only 9% of the total water withdrawal in Africa. Table 1 and 2 (at the end of this paper) present regional water resources and water withdrawal for the African continent, respectively.

By far, the largest share of the world's irrigated lands are in the Asia and Pacific region. The distribution of irrigated lands in 1990 was as follows: in the developing countries, on a regional basis, Asia = 112 million ha;

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Africa = 14 million ha; Latin America = 16 million ha; and Near East = 10 million ha. The total irrigated area in the developed countries include 98 million ha. Much of the irrigation potential on the African continent remains to be tapped.

According to FAO, the total area irrigated in East and southern Africa amounts to 1.6 million ha and 0.4 million ha respectively. This is illustrated in Table 3.

FAO proposes to make a major effort to redress this situation. Droughts have costs beyond the immediate loss of production. They have long-term depressing impacts. Recent studies of drought in the Sahel, the Horn of Africa and southern Africa have revealed the total impact of recurring droughts in terms of famine, loss of lives and damage to the environment. Rational development and improved management of water resources hold the key to achieving food security on the African continent.

WATER RESOURCES DEVELOPMENT POLICY ON ZAMBIA

Zambia's Water Policy is aimed at promoting sustainable water resources development with a view to facilitating an equitable provision of adequate quantity and quality of water for all competing users at acceptable costs and ensuring security of supply.

In order to achieve sustainable water resources development the following measures and strategies are declared by the Zambian Government:

- ❖ Recognition of the importance of water in the overall socio-economic development,
- ❖ state control of the water resources,
- ❖ promotion of integrated management of water resources development,
- ❖ definition of institutional responsibilities,
- ❖ development of an institutional and legal framework for management of water resources,
- ❖ promotion of preparedness for floods and droughts, and
- ❖ recognition of water as an economic good.

Major highlights of the National Water Policy of Zambia are:

- ❖ Recognition of the importance of water in the overall socio-economic development,
- ❖ state control of the water resources,
- ❖ integrated management of water resources development,
- ❖ legal framework for management of water resources,
- ❖ Recognition of water as a economic good,
- ❖ water tariffs should reflect the costs and true economic value of the commodity.

With regard to agricultural water use, the Zambian National Water Policy states the following:

Three distinct uses are recognized under this category and these include water for irrigation, livestock watering and freshwater aquaculture. Each of these user categories require certain water quality specifications as:

- ❖ water shall be considered fit for irrigation if: (a) it does not cause soil degradation; (b) enhances high crop yield; and (c) ensures sustainability of production.
- ❖ water for livestock and aquaculture shall be free from any contamination so as not to cause ill health problems to animals, aquatic life, consumers and users of the product.

ENVIRONMENTAL IMPACTS OF IRRIGATION

Irrigation development implies substantial modification to the natural environment. It involves not only physical changes but also social and economic impacts. In order to optimize the benefits of irrigation developments, adverse impacts on environment and human health will have to be minimized. Table 4

provides an analysis of some of the serious environmental problems of irrigation and drainage projects and relevant mitigation measures.

It is obvious that recognition of environmental and health problems will have to be made at the very early stage of irrigation project planning. This will enable to make an early decision as to whether the project should be constructed or not and if it is to be constructed what remedial measures will need to be incorporated. In order to assess the environmental effects, a certain procedure has been established, which is commonly called the environmental impact assessment (EIA). EIA may be defined as a formal process to predict the environmental consequences of human development activities and to plan appropriate measures to reduce adverse effects.

HEALTH IMPACTS OF IRRIGATION

Health impacts of irrigation are perhaps the most relevant aspect in this Workshop. This is also a subject that will be very well covered by other papers. Only a brief note is provided in this paper.

Water is a favourable medium for the spread of disease, carrying bacterial and viral pathogens. It also plays an important role in the transmission of parasites, either directly or by providing habitats for disease vectors.

Water-based and water-related vector-borne diseases are most likely to be found in areas where irrigation has been introduced. Among them, malaria is by far the most important, both in terms of the number of people annually infected, whose quality of life and working capacity are reduced, and in terms of its death rate. Worldwide, some 2000 million people live in areas where they are at risk from malaria and the total number of cases is estimated at 100 million a year. Drug treatment has become difficult recently because the parasite has become resistant to certain drugs that have been used for a long time in many parts of the world. Interruption of disease transmission using chemicals for the control of the vector mosquitoes has become less effective because many mosquito vector species have become resistant to insecticides.

Schistosomiasis (also known as bilharzia) is almost as widespread as malaria, but rarely causes immediate death. An estimated 200 million people are infected per year and the transmission occurs in 74 countries. The infection is particularly common in children who play in water inhabited by the snail intermediate host. Severe infection at this age leads to long-term damage to bladder, kidneys and liver, which may cause death many years after the original infection. Heavy infections at any age can make people feel unwell and affect their working capacity.

The risk that one or more of these diseases is introduced or has an increased impact is most likely in irrigation schemes where:

- ❖ soil drainage is poor, drainage canals are either absent, badly designed/and or maintained;
- ❖ rice or sugar cane is cultivated;
- ❖ night storage reservoirs are constructed;
- ❖ borrow pits are left with stagnant water;
- ❖ canals are unlined and have unchecked vegetation growth; and
- ❖ there is settlement of new immigrants who lack immunity or bring in new sources of infection.

STRATEGIES FOR SUSTAINABLE IRRIGATION DEVELOPMENT

Sustainable irrigation development refers to planning, construction, operation, maintenance and the overall management of irrigation programmes and projects in such a manner that there is increased production per unit of land and water use, optimum economic and social return on investment and enhancement of environment and public health. It is only in this comprehensive context, irrigation development will be sustainable. In order to achieve the above said goals, Nations should ensure that certain pre-requisites are put in place. Some important pre-requisites are:

- (a) a national irrigation policy within the framework of the national agricultural and economic development policies;

- (b) a national irrigation development strategy;
- (c) a national irrigation development plan or programme, often called the "national irrigation master plan";
- (d) a national institutional and human resources capacity that would support the proposed irrigation development plan; and
- (e) a national environmental and health protection plan that will guide the irrigation development programme.

It is evident from the above, that irrigation development is not solely in the domain of irrigation engineers and agriculturists. It requires a multi-disciplinary approach which includes specialists in economics, environment, public health, sociology and others. In addition, successful irrigation development will require active participation of beneficiaries, namely, the farmers, the communities and most importantly women.

A CASE STUDY FROM ZIMBABWE

On the request of the Government of Zimbabwe, FAO provided assistance to the country to formulate and implement national irrigation programmes on a sustainable basis. The activities consisted of formulation of a National Action Programme on Water and Sustainable Agricultural Development (NAP-WASAD); formulation of a national irrigation policy and strategy; and formulation of TORs for a national irrigation master plan.

NAP-WASAD of Zimbabwe

The NAP-WASAD was formulated in 1993 as a framework for sustainable irrigation development involving a multi-disciplinary team. WHO was involved in the formulation of the NAP-WASAD. The NAP-WASAD contains a comprehensive analysis of the irrigation sub-sector in Zimbabwe and an action programme composed of 16 projects under five themes. Table 5 presents the features of the NAP-WASAD of Zimbabwe.

Highlights of Zimbabwe Irrigation Policy

- ❖ The rate of development of the remaining exploitable 3 740 MCM of water should be increased. Where the exploitable potential has been fully developed, greater emphasis should be placed on more efficient and greater equity of water use. Trans-catchment transfers should be considered where feasible. Greater efforts should be put into assessing and exploiting groundwater resources.
- ❖ Irrigation technology to cover sprinkler, surface and micro-irrigation shall be availed to all categories of irrigation farmers in spite of any current patterns of adoption and use. This is largely aimed at improving the current low levels of water use efficiency by all categories of farmers. As part of this policy, priority is placed on farmer-managed and operated systems. Where government may assist in development, the farmers should retain the responsibility for operation and maintenance of the irrigation system.
- ❖ There is need to invest in human resources development in irrigation in order to implement the strategy and to meet the objectives of this policy. Manpower planning shall encompass present and future needs, both in terms of quantity and quality. Training should also be cognisant of the multidisciplinary nature of the river basin approach to planning and development.
- ❖ Effective water users associations shall be encouraged and facilitated in order to involve irrigation farmers and other water users and interest groups to participate fully in planning, development and evaluation of irrigation projects. The current River Boards and Irrigation Management Committees should be reformed and strengthened to allow broader participation and greater responsibility in irrigation development.
- ❖ Environmental sustainability of irrigation projects is a key policy objective and all future development shall incorporate adequate assessment and monitoring of this aspect. Environmental quality should be

maintained in the broad areas of soil quality, water quality, pesticide use, use of wetlands for cropping and grazing, human health and settlement. Irrigation development shall observe all laws pertaining to the environment. In future, all major developments shall be preceded by a full environmental impact assessment (EIA). Guidelines shall be developed for assessing smaller systems where full EIA may not be justifiable.

- ❖ Water pricing policy in future should reflect the scarcity of this valuable commodity. The price of water, therefore, should take its opportunity cost into consideration in order to arrest its wastage and inefficient use. It is policy that in future, costs of operation and maintenance of irrigation systems be met directly by beneficiaries. Any subsidies on O & M costs should be justifiable and targeted on a case by case basis.

RECOMMENDATIONS

Scarcity and misuse of water pose a serious and growing threat to food security, human health and well-being, industrial development and ecosystems on which they depend. FAO's policies and programmes recognize the vital role of water in sustaining and supporting life, focusing in particular on sustainable agriculture and rural development. Scarcity and poor quality can have a dramatic impact not just on agricultural production, but on all aspects of everyday life, very often adding to the burden of women.

The success of implementing the FAO's programmes and policies relating to water resources development and management at national and regional level depends on:

·the commitment of the national governments and their continued support to the objectives and goals of food security and sustainable management of water resources,

- ❖ the coordination of activities in relation to water use and agricultural development among countries within a region and between these countries and regional and international institutions,
- ❖ the adoption of a holistic approach in utilizing water for agricultural development taking into consideration technical aspects as well as economic, social, political and cultural factors;
- ❖ the full involvement of farmers during all stages of water planning, development and management;
- ❖ the effective involvement of local NGOs and the private sector; and
- ❖ the support of multilateral and bilateral organizations, particularly in terms of technical cooperation, funding and improved coordination of external assistance.

TABLE 1
Regional distribution of water resources

Region	Area	Precip.	Internal renewable resources			
	(1000 km ²)	(km ³ /yr)	(km ³ /yr)	(mm/yr)	% of total	% of precip.
Northern	5 753	411	50	8.7	1.2	12.2
Sudano-Sahelian	8 591	2 878	170	19.8	4.3	5.9
Gulf of Guinea	2 106	2 965	952	452.0	23.8	32.1
Central	5 329	7 621	1 946	365.2	48.8	25.5
Eastern	2 916	2 364	259	88.8	6.5	11.0
Islands (I.O.)	591	1 005	340	575.3	8.5	33.8
Southern	4 739	2 967	274	57.8	6.9	9.2
Total	30 025	20 211	3 991	132.9	100.0	19.7

TABLE 2
Regional distribution of water withdrawals

Region	Withdrawals by sector					
	Agriculture	Communities	Industries	Total	As % of total	As % of internal resources
	×10 ⁶ m ³ /yr	×10 ⁶ m ³ /yr	×10 ⁶ m ³ /yr	×10 ⁶ m ³ /yr	%	%
Northern	65 000 (85%)	5 500 (7%)	5 800 (8%)	76 300 (100%)	50.9	152.6
Sudano-Sahelian	22 600 (94%)	1 200 (5%)	300 (1%)	24 100 (100%)	16.1	14.2
Gulf of Guinea	3 800 (62%)	1 600 (26%)	700 (12%)	6 100 (100%)	4.1	0.6
Central	600 (43%)	600 (43%)	200 (14%)	1 400 (100%)	0.9	0.1
Eastern	5 400 (83%)	900 (14%)	200 (3%)	6 500 (100%)	4.3	2.5
Islands (I.O.)	16 400 (99%)	200 (1%)	20 (-)	16 620 (100%)	11.1	4.9
Southern	14 100 (75%)	3 000 (16%)	1 800 (9%)	18 900 (100%)	12.6	6.9
Total	127 900 (85%)	13 000 (9%)	9 020 (6%)	149 920 (100%)	100.0	3.8

TABLE 3
Regional distribution of water management methods

Region	Irrigation				Other cultivated wetlands/ valley bottoms	Flood recession cropping	Total		
	Full or partial control	Spate irrigation	Equipped wetlands/ valley bottoms	Total irrigation			'000 ha	as % of total	as % of cultivated land
	'000 ha	'000 ha	'000 ha	'000 ha					
Northern	5 610 (95%)	305 (5%)	- (-)	5 915 (100%)	- (-)	- (-)	5 915 (100%)	41.5	24.8
Sudano-Sahelian	2 263 (79%)	212 (7%)	9 (-)	2 484 (86%)	97 (4%)	296 (10%)	2 877 (100%)	20.2	12.1
Gulf of Guinea	307 (22%)	- (-)	163 (11%)	470 (33%)	193 (14%)	730 (53%)	1 393 (100%)	9.8	4.0
Central	119 (25%)	- (-)	2 (-)	121 (25%)	352 (74%)	3 (1%)	476 (100%)	3.3	3.9
Eastern	428 (65%)	- (-)	6 (1%)	434 (66%)	222 (34%)	- (-)	656 (100%)	4.6	2.9
Islands (I.O.)	1 105 (100%)	- (-)	- (-)	1 105 (100%)	- (-)	- (-)	1 105 (100%)	7.7	40.3
Southern	1 645 (90%)	- (-)	- (-)	1 645 (90%)	182 (10%)	9 (-)	1 836 (100%)	12.9	8.1
Total	11 477 (81%)	517 (4%)	180 (1%)	12 174 (86%)	1 046 (7%)	1 038 (7%)	14 258 (100%)	100.0	9.9

Main problems resulting in the non-sustainability of irrigation and drainage schemes and appropriate mitigation measures.

Problem	Mitigation measures
<p>Degradation of irrigated land: Salinization Alkalization Waterlogging</p>	<ul style="list-style-type: none"> - Improve I & D operation to match demand both 'how much & when' - Provide drainage including disposal of water to evaporation pond or the sea if quality of river flow adversely affected by drainage water. - Maintain channels to prevent seepage, and reduce inefficiencies resulting from siltation and weeds. allow for access to channels for maintenance in design. - Provide water for leaching as a specific operation - Set-up or adjust irrigation management infrastructure to ensure sufficient income to maintain both the irrigation <u>and</u> drainage systems. - Analyse soils and monitor changes so that potential problems can be managed.
<p>Reduced socio-economic conditions: Increased incidence of water-related disease increased inequity Weaker community infrastructure</p>	<ul style="list-style-type: none"> - Manage I & D to prevent disease spread - Educate about causes of disease. - Improve health facilities. - Allow sufficient time and money to resource extensive public participation to ensure that plans are optimal, that all sections of affected society are considered and that local institutions are in place to sustain irrigated agriculture, particularly in respect of land and water rights. - Consider markets, financial services and agricultural extension in conjunction with proposed irrigation and drainage changes. - Ensure that agricultural intensification does not preclude other economic or subsistence activity, such as household vegetables, fodder or growing trees for firewood. - Provide short-term support and/or skills for an alternative livelihood if irrigation removes existing livelihood
<p>Poor water quality:- Reduction in irrigation water quality Water quality problems for downstream users caused by irrigation return flow quality</p>	<ul style="list-style-type: none"> - Define and enforce return water quality levels (including monitoring). - Control industrial development - Designate land for saline water disposal; build separate disposal channels. - Educate for pesticide or sewerage contamination dangers - Monitoring irrigation water quality
<p>Ecological degradation:- Reduced bio-diversity in project area Damage to downstream ecosystems due to reduced water quantity and quality</p>	<ul style="list-style-type: none"> - Define ecological requirements - Operate dams to suit downstream requirements and encourage wildlife around reservoirs (see Sections 4.1.3 and 4.5) - Designate land (in law and supported by protection institutions) for flood plains; wetlands; watersheds; drainage water disposal; river corridors.
<p>Ground water depletion Dry drinking & irrigation wells Saline intrusion at coasts Reduced base flow/wetlands</p>	<ul style="list-style-type: none"> - Define and enforce abstraction regulations. - Monitor ground water levels - Adjust abstraction charges.

Objectives of the sub-programmes of the National Action Programme of Zimbabwe

SUB-PROGRAMMES	OBJECTIVES
<p>Sub-programme 1 Irrigation policy, strategy, master plan and legislation</p>	<p>a. To formulate a comprehensive national irrigation policy and strategy for Zimbabwe to enable the country to achieve its agricultural production and economic development goals on a sustainable basis.</p> <p>b. Under the framework of the policy and in accordance with the strategy to develop a master plan for national irrigation development covering all types of irrigation schemes, in terms of scale, land ownership and management.</p> <p>c. To develop a legal and institutional framework for irrigation water users' associations. These will include river basins and irrigation management committees.</p>
<p>Sub-programme 2 Water resources database, ground water hydrology and river basin management</p>	<p>a. To establish a computerized surface water resources database, including surface runoff, potential yields, demand, supply and potential for further development. Data will also include information pertaining to dam storages and irrigation water usage.</p> <p>b. To study the groundwater potential of the country in a systematic manner with reference to the capacity of selected high potential aquifers, their yields and hydrogeological characteristics.</p> <p>c. To develop a methodology and apply such a methodology for an integrated river basin planning approach for irrigation development with particular reference to the Save Basin.</p>
<p>Sub-programme 3 Irrigation development research, technology transfer and socio-economic aspects</p>	<p>a. To develop guidelines for the planning, development and management of smallholder irrigation projects, adopting an integrated approach, and apply such guidelines in a smallholder irrigation project from planning to construction and operation.</p> <p>b. To improve operation and maintenance of irrigation schemes through the assessment of performance and the introduction of appropriate measures.</p> <p>c. To strengthen irrigation, research and extension base and technology transfer mechanisms.</p> <p>d. To develop a methodology for an integrated economic and social viability assessment of irrigation development and apply the developed methodology in assessing the viability of current and future projects.</p>
<p>Sub-programme 4 Human resources development and institutional strengthening</p>	<p>a. To strengthen post-graduate training, particularly at MSc level, in irrigation engineering and water management.</p> <p>b. To enhance the technical capacity of professionals in the field of irrigation, water resources development and environmental protection.</p> <p>c. To strengthen water users' associations, including river boards and irrigation management committees.</p>
<p>Sub-programme 5 Environmental protection and health of rural communities</p>	<p>a. To strengthen national capacity to monitor water pollution and implement pollution control.</p> <p>b. To develop EIA guidelines and application of the guidelines for new and existing projects.</p> <p>c. To build national capacity to enable incorporation of health components in irrigation projects.</p>

WATER RESOURCES DEVELOPMENT IN ZAMBIA

Mr P. Chola & Mr C. Masela

INTRODUCTION

Water resources form the basis of socio-economic development. Zambia has abundant water resources compared to other countries in the southern African sub-continent. Unfortunately only about 3% of these important resources have been developed. The development of water resources has for a long time been over-shadowed by the conflicting roles of the Department of Water Affairs, that is, domestic water supply functions and water resources development.

This paper looks at the development of surface and ground water resources in Zambia and also outlines policies and strategies for sustainable water resources management. Finally it looks at the legal framework, the organisational and institutional set-up.

CURRENT AND POTENTIAL DEVELOPMENT IN RIVER BASINS

There are few noteworthy water resources development projects in Zambia's major river basins. The main development schemes include river flow regulation, irrigation, navigation waterways, water supply, waste water treatment and hydroelectric power generation.

Zambezi basin

The Zambezi River Basin is the largest river system in Zambia. The available water resources come from the Zambezi River and its main tributaries, Kabompo and Lui rivers.

Notable developments in this basin are the hydro power generation at Victoria Falls (108MW) and Kariba Dam (1266MW). Tourism potential is very much exploited at Victoria Falls, Lake Kariba and the Zambezi Flood Plains where boating and fishing are the main activities. Water ways have been developed in the plains for navigation.

Irrigation development in the Zambezi Valley, after the Flood Plains, could be developed based on small dams and pumping from Kariba and from ground water. In view of low rainfall, the yield of the small rivers is very low; all rivers become dry during the dry season and storage is required to provide a continuous water supply. Given the absence of limestone aquifers, ground water development will be limited. The need for irrigation is felt most strongly in this part of Zambia, due to a combination of low-rainfall and relatively high population density.

Kafue basin

The Kafue River runs for 1576 Km before it flows into the Zambezi. The basin is 152 000 Km² and generates a mean annual runoff of 350 m³/sec which is 12% of the Zambezi mean annual runoff at the confluence.

The Kafue Basin is the most developed river basin in the country, because it runs through the copperbelt and the Midlands where the railway line passes and major industrial towns are located. It is the most utilized river in the country. Irrigated agriculture is highly developed and the basin has a potential for hydropower generation, fisheries and tourism. The development of the Itezhi-Tezhi Dam (54 400 Km²) and Kafue Gorge Dam (800 Km²) for hydroelectric power generation have also enabled easy management of the river flows through control headworks at Itezhi-Tezhi.

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The Kafue water use cannot be complete if water supply and waste water disposal are not mentioned. Almost all the major towns along the line of rail get water supply from the Kafue and discharge treated waste water directly or indirectly into this river.

Luangwa basin

The Luangwa River runs 867 Km southwards from the Muchinga Escarpment and discharges into the Zambezi at Feira. The average annual runoff at the confluence is estimated at 500 m³/sec and this constitutes about 17% of the total basin flow of the Zambezi. The annual rainfall in the Luangwa Basin varies from 800 to 1100 mm, decreasing southwards. The effect of this rainfall differential can be noticed in the runoff pattern, most of the rivers in the southern part dry out towards the end of the rain season. The rivers which rise from the higher plateau in the northern part are, however, perennial. The Luangwa River flow is characterised by high turbidity and sedimentation load of the order of 8.0 x 10 tons/year.

A considerable number of small earth dams have been constructed to provide reliable perennial water supply on those rivers which fall dry in the dry season. Chipata, Lundazi, Nyimba and Chadiza towns get their water supplies from dams on rivers that drain into the Luangwa.

Some 176 000 ha have been developed for irrigation in the Mkushi Block and the Lunsemfwa and Mkushi Land. The main crops grown under irrigation are maize, wheat, Irish potatoes, vegetables and citrus.

Luapula, Chambeshi and Lake Tanganyika basins

These catchments receive almost the highest rainfall in the country and rivers flow throughout the year. The mean annual rainfall varies between 1100 mm and 1500 mm. The Chambeshi/Luapula Basins drain into Lake Mweru which in turn drains into the Zaire Basin. Navigation is very much developed in these basins.

The Chambeshi is 579 Km from the source before it flows into the Bangweulu Swamps. From the Bangweulu, the Luapula River, as the Chambeshi is later called, runs 677 Km dividing Zambia and Zaire before it flows into Lake Mweru.

Irrigated agriculture is developed at Mununshi Banana, Kawambwa Tea, Kateshi Coffee Schemes and Chambeshi Flood Plains where bananas, tea, coffee and rice are grown, respectively. The Tazara Corridor, Luapula Valley and Plateau have high irrigation potential for wheat, citrus, sugar cane, maize and rice.

The hydropower generation potential has been realized at Chishimba Falls on the Lukulu, Lunzua, Lusiwasi and Musonda Falls on the Luongo River. There are many other rivers both in Luapula and Northern Provinces that could be enhanced for hydropower generation.

To improve communication in the Bangweulu and Luapula Valley Swamps water channels have been developed by dredging and weed clearing. The waterway networks on Bangweulu developed between 1960 and 1970 improved communication from Samfya in Luapula; Serenje in Central; Mpika or Luwingu in Northern Province to Chilubi Island on Lake Bangweulu. The Luapula Valley mainland is connected to the Luapula River by means of water channels.

Surface water management problems

The Department of Water Affairs has a hydrometric network of about 250 stations countrywide. Almost half of these have closed down in the last 5 - 10 years due to poor funding and lack of personnel to man the stations. And yet the management of surface water resources requires the availability of continuous records of data. Significant among these are low flows and high flows, based upon which the Water Board can allocate the available water to various users depending on their demands. The hydrology section has been unable to collect critical up-to-date filed data due to poor funding and logistical support. This makes the management of the resource difficult. Furthermore, it is even impossible to make forecasts of hydrological events like droughts and floods.

GROUND WATER DEVELOPMENT

Ground water is an important and strategic resource. Its occurrence is wide spread and often during the dry months of the savanna climate when streams dry up, it is the only source of water for rural communities. Ground water in Zambia is not fully utilized as less than 1% of an estimated recharge of 160 million m³/d is discharged from mining operations and of this only 40% is used for domestic purposes. The rest is discharged mainly into the Kafue river.

Aquifers in Zambia

The most important aquifers in Zambia are the Karstic dolomite and limestone aquifers. They are generally flat lying and receive an annual recharge of 160-200 mm/a, representing 20 - 30% of annual rainfall. These aquifers are used for urban water supply and irrigation in Lusaka, Kabwe, Ndola and Mpongwe. Most wells in these aquifers are relatively shallow and have yields up to 50 m³/h.

The Kalahari sand aquifers in the Upper Zambezi basin form the next in importance. The aquifers have a good potential for ground water development, with yields of up to 20 - 30 m³/h/m.

Karoo deposits form poor aquifers with generally low yields and poor water quality.

Basement rocks are poor yielding aquifers with average yields of up to 5 - 10 m³/h, only suitable for rural water supply and not for large scale irrigation.

Ground water development problems

Ground water development in Zambia has been rather poorly coordinated and unsystematic. Ground water has often been utilized for rural water supply to mitigate effects of drought and as a source of urban water supplies, and yet little has been done to develop the resource. Presently there is a lack of information on ground-water potential of various catchments, continuous ground water table fluctuations, water quality and pollution, and no ground water parameter maps. Given the drought situation this country has had since 1991, it makes forecasting, predictions or planning with regard to ground water resources very difficult.

Ground water management

The dolomite and limestone aquifers in the Lusaka area deserve a special mention here, as ground water development has grown, well discharge in some parts of the aquifers has exceeded the natural recharge. Ground water levels have receded and the pumping cone has rapidly grown. In the early fifties (up to probably 1965) Lusaka derived its water supply entirely from ground water and an estimated 44 000 m³/d was being pumped. Between 1980 and 1995 around 110 000 m³/d is being pumped. There has been a steady reduction in precipitation between 1991 and 1995, due to drought in the region. The difference between the recharge and ground-water pumpage comes from aquifers storage.

There is urgent need for appropriate management of these aquifers and the following are some aspects of management required:

1. Establish the amount of natural recharge in order to avoid mining of the aquifers.
2. To control the number of wells springing up on the aquifer and also to monitor ground-water fluctuations and pollution.

Trends in water resources management

1. Water is increasingly being held to be public rather than private resource. For some reason we have held on to the English Rule of absolute ownership of ground-water, even when the English changed the concepts of ownership in their Water Resources Act of 1963. Fortunately our Water Act is under review and the ground water status shall be changed from private to public water ownership vested in the President.

2. Traditionally water rights have need considered in connection with off stream purposes such as irrigation, municipal use and in-stream uses such as water for energy development. Other in-stream purposes that are important for public purposes such as maintenance of water quality and fish and wildlife habitat ought to be considered.
3. Worldwide, governments are moving to protect the quality of ground-water in aquifers. This is one of the most important aspects of ground water management. There are many sources of potential ground water pollution such as septic tanks, sanitary landfills, land treatment systems for municipal waste water, waste injection wells toxic chemical disposal sites, cemeteries, mine tailings, acid mine drainage, agricultural chemicals and fertilizers, accidental oil, gasoline and chemical spills. This indicates that the earth is typically thought of as the most convenient repository for material that society does not know how to handle.

To prevent ground water pollution we need to identify the recharge areas of aquifers and have them zoned as water quality conservation areas, with close control of potential sources of contamination. Hazardous and toxic waste storage and disposal should be barred from aquifer recharge areas. Sanitary sewers for collection of domestic wastewater are preferable to septic tanks. Agricultural practices should be regulated. Over-application of chemical and fertilizers should be discouraged. Abandoned wells must be filled.

WATER RESOURCES AND VECTOR-BORNE DISEASES

The construction of hydraulic structures such as dams, weirs and canals usually controls the flow of water in river courses. The purpose of river regulation is to save water at high flow in order to use it at low flow. This tends to disrupt the native flora and fauna in flood plains and also brings about stagnant or slow moving water which creates good habitat for the breeding of mosquitoes, snails and river flies. These are responsible for vector borne diseases like malaria, bilharzia (schistosomiasis) and river blindness.

In many parts of Lusaka ground water pollution results from its connection with pit latrines and individual refuse disposal pits. Only about 32% of the city is serviced by sewer lines whereas the rest of the city uses septic tanks which are susceptible to leakages. Contaminated ground water from shallow wells and the top of the aquifers can lead to various water borne diseases such as cholera, dysentery and typhoid.

POLICIES AND STRATEGIES FOR SUSTAINABLE WATER RESOURCES MANAGEMENT

Policy framework

Until November 1994 when the water policy was approved the emphasis of the Department of Water Affairs was on water supply functions, pushing water resources development in the background. The Department shall now concentrate on water resources development and management.

The Water Policy aims at promoting sustainable development with a view to facilitating equitable provision of water in adequate quality and quantity for all competing users at acceptable costs while ensuring security of supply under varying conditions.

In order to achieve sustainable water resources management, the policy emphasises a holistic approach recognizing a comprehensive spectrum of demands and evaluating priorities in the framework of the national water master plan. Water usage and stakeholders identified are: domestic, agricultural, industrial, hydroelectric generation, navigation, tourism/recreation fisheries and environmental protection.

Some of the objectives are:

- ❖ To develop schemes for conservation management and utilization of water for improved availability. We have in mind conservation methods like the construction of earth dams, terraces, river training and rainfall harvesting.

- ❖ To establish a network for continuous monitoring and assessment of water resources availability: improvement and re-opening of new gauging stations, establishment of country-wide ground water monitoring network, regional mapping and characterisation.
- ❖ To provide up to date information on water resources for effective planning development, management and utilisation.
- ❖ Various ground water parameter maps, water resources periodicals in response to the needs of our clients.
- ❖ To establish and maintain an efficient and effective management information system.

National Water Master Plan

The National water Master Plan provides a good basis for water resources development and allocation by making possible the estimation of water resource availability, facilitating prioritization of project development, and helping to set strategies to achieve development goals.

The Government of Zambia has completed the final draft of the National Water Master Plan (August, 1995) which has taken stock of the resources and has devised a plan of action for water resources development up to the year 2015. Priority objects are:

- ❖ Ground water development in the drought prone areas of southern part of Zambia.
- ❖ Multipurpose dam construction at strategic places throughout the country.
- ❖ Establishment of a ground water development training school to be affiliated to the University of Zambia to train hydro-geologists and drilling technicians.

Development of new water resources including re-use

Policy makers and implementers in semi-arid and arid regions should:

- ❖ Give priority to rehabilitation and maintenance of existing structures.
- ❖ Train users in the operation and maintenance of these facilities.
- ❖ Encourage conjunctive water-use.

The general trend in Zambia was to go for new investment rather than preventive maintenance and rehabilitation of existing infrastructure. Many of our development schemes have gone into poor state of disrepair and are sometimes totally rundown since there was no policy encouraging preventative maintenance. To maximise benefits it is better to rehabilitate existing facilities than to develop new ones. Wastewater use for irrigation should be encouraged in the rainfall deficient areas of the country. Recycled waste water, after proper treatment for irrigation, can be used to promote food production.

Community mobilization and involvement in water management projects.

To ensure sustainable management of water resources local communities must be involved in project planning, execution, operations and maintenance, monitoring and evaluation of projects. This will enhance a sense of ownership and ensure project sustainability. The Water Supply, Sanitation and Health Education (WASHE) Committees which started in Western Province have been extended to other provinces. The WASHE concept encourages community participation at all levels of water supply and sanitation projects. In each village where a water point will be constructed the villagers are required to form such a committee before any works can start. Membership is drawn from influential members of the communities and women are adequately represented. The WASHE Committee will be responsible for operation and maintenance of the water facilities when completed.

Environmental Impact Assessment

Care must be exercised to prevent water table build-up and the consequent soil salinization by improved efficiency of water application for irrigation.

All water management projects should be subjected to vigorous environmental impact assessment to ensure that they are “environmentally friendly”.

The Zambian Government should seriously address the following when carrying out environmental impact assessment for future projects, *inter alia*:

- ❖ land tenure, acquisition, compensation and re-settlement
- ❖ water right allocation and its impact on social equity.
- ❖ new water demands and their impact on existing users
- ❖ ground water level changes and their impact on waterlogging and land salinization.
- ❖ the effect of effluent discharges on the quality of receiving water
- ❖ the effect on downstream river due to intake and outlet of water.
- ❖ aquatic and terrestrial fauna and flora in the river channel, dam reservoir, riparian strip, surrounding wetlands and along wildlife corridors
- ❖ sedimentation in reservoirs and degradation of downstream river bed resulting from construction of dams
- ❖ soil erosion due to expansion of agricultural land

LEGAL FRAMEWORK AND ENFORCEMENT

Water is a public good. Every person has the right to access this resource within the provisions of the law. Appropriate legal frameworks should be established to ensure the protection of all sources of water from pollution and its efficient allocation among recognised uses. To accomplish this, effective enforcement mechanisms must also be in place. These mechanisms are not yet fully developed in Zambia due to lack of adequate skilled manpower, inadequate funding and lack of community awareness.

Zambia has passed new legislation on the protection of the environment and the establishment of the Environmental Council as a watchdog against pollution. The major legal enactments on water use in the land are:

- Water Act Cap 312 and statutory instruments:
 - Water Rights (Registration) Rules
 - Water Board (Charges and Fees) Regulation, 1993
 - Water Board (Works) Regulation, 1993
- Natural Resources Conservation Act Cap 315
- Environmental Protection and Pollution Act No. 12 of 1990 and Statutory Instrument:
 - Water Pollution Control (Effluent and Waste Water) Regulation, 1993.
- Local Government act No. 22, 1991
- Land acquisition Act Cap 296

The Water Act is being revised and very soon an Amendment will be passed. The following provisions have been added to the current Act:

- ❖ Groundwater status to be changed from “private” to “public water” and ownership vested in the President.
- ❖ Water rights in traditional land will be granted by the Water Board unlike in the past where concessions were approved by the minister.
- ❖ The Environmental Council has been mandated to prosecute polluters of public water.

The following are major omissions in the current legislation which are hindrances in the management of water resources.

- ❖ The current Water Act is not applicable to the Luapula, Zambezi and that portion of the Luangwa which constitutes the boundary between Zambia and Mozambique. This means that those parts of the boundaries between neighbouring countries are not covered by the Act. However, the Zambezi portion bordering Zambia and Zimbabwe is managed through the Zambezi River Authority Act.
- ❖ Technical standards and regulations for water resources development and management: regulations or norms for planning, design, operation and maintenance of water resource facilities are not well established in the legislation.
- ❖ The Natural Resources Advisory board is still listed as a statutory Body responsible to the Ministry of Environment and Natural Resources though it has lost its legal status. This needs to be corrected.
- ❖ Registration of industrial discharges to the Environmental Council is not mandatory by law.

ORGANIZATIONAL AND INSTITUTIONAL ARRANGEMENTS

It is important to clarify the roles and responsibilities of key government institutions in terms of executive and regulatory functions to avoid duplication and ensure effective implementation of policies. It is hoped that the public reforms being implemented in Zambia will address this. Water supply responsibilities have been transferred to local Councils in the Ministry of Local Government and Housing and will be regulated by the National Water Supply and Sanitation Council which will be established in the Ministry of Energy and Water Development. The Department of Water Affairs has remained with the responsibility of water resources development and management. National information systems and data bases should be developed and/or strengthened in all institutions to assist decision-making and ensure effective co-ordination of development activities.

CONCLUSION

Despite the abundance of water resources in the country and the vast potential for development, water resources have remained poorly developed and managed. Less than 5% of the available water resources are developed. Problems hampering the development of the resources have been outlined. The development of the resources of irrigation schemes and the construction of dams for hydropower generation brings about slow moving water which serves as breeding ground for mosquitoes, snails and river flies. These are responsible for malaria, bilharzia (schistosomiasis) and river blindness. These in turn reduce the life span of the people living in these areas. It is hoped that approval of the water policy and adaption of strategies that emphasize the legal framework will be put in place and the country will not only improve but take on a positive and upward trend, encompassing aspects of health education and the environment.

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TECHNICAL PAPER ON VECTORS AND VECTOR-BORNE DISEASES

Chris Kashinga¹

INTRODUCTION

Water resources development projects the world over particularly in the tropical and sub-tropical regions are usually punctuated by substantive impacts on the environment. Human health is one aspect negatively impacted upon by such projects. Some common communicable diseases such as bilharzia and malaria are transmitted by organisms (vectors) which are dependent on water for their propagation. Projects concerning water resources development often result in either an increase in the number of vectors or the frequency of contact between human communities and vectors.

The resulting effect of such a course of events is an increase in the incidence of disease cases. The Kariba Dam, on the border of Zambia and Zimbabwe, is one of the well documented examples in Africa, where bilharzia came with the construction of the dam. The dam was constructed with well intended economic benefits such as hydroelectric power generation and, to a lesser extent, irrigation but ended up bringing untold misery on the local community in terms of an additional disease burden.

Regardless of the negative impacts, development of water resources cannot be stopped as the majority of the world population depends on such projects in one way or the another. However, some considerations need to be met and these include -:

- ❖ a strong, morally and legally binding commitment to finance and implement projects which uphold public health and safety.
- ❖ Scheduling a rapid, simple, cheap but comprehensive assessment guideline to predict the incidence of disease at any stage of the project cycle.

DISTRIBUTION OF VECTOR-BORNE DISEASES

The transmission of vector-borne diseases depends on a host of factors, some of which have nothing or little to do with geographical location.

Vector and vector-borne diseases are not distributed uniformly but occur in discrete patches where the habitat is favourable. It is extremely important to be mindful of the fact that a development project can completely alter the environment and create a new habitat, previously non-existent. If, for instance, disease occurs within an area, the probability of invasion of the habitat is high and transmission may occur.

How transmission of diseases by vectors occurs.

In vector-borne diseases the pathogen or parasite leaves an avian (bird) or a mammalian host and then undergoes a metamorphosis in an insect, crustacean or snail before entering a new avian or mammalian host. Environmental Health Engineering seeks to modify the environment in such a way as to eliminate suitable vector habitats and thus prevent or reduce transmission.

Some vectors common in Zambia and the vector-borne diseases they transmit

Mosquitoes. Mosquitoes are by far the most important family of insect vectors. Mosquitoes are divided into two groups namely anophelines and culicines. Only anophelines can transmit malaria, but not all anophelines do so. Other mosquito-borne diseases such as Bancroftian filariasis and onyongnyong virus are not evident in Zambia. Mosquitoes acquire the disease organism when feeding on an infected host and pass it during a subsequent bloodmeal. Only the female *Anopheles* mosquito suck blood and she does so to mature a batch of

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eggs. There are over 3000 species of mosquitoes of which only about 100 are of medical importance. Mosquito eggs are laid in water. Preferred sites include containers, edges of reservoirs, sunlit rainpools, shaded water and foul water. The type of vegetation is also important.

Environmental control methods for anophelines. The method of control vary according to the type of breeding site. For instance:

- ❖ Mosquitoes breeding in isolated pools associated with impoundments may be controlled by bank slope and removing vegetation.
- ❖ Mosquitoes which breed among new vegetation at the edges of impoundments where the larvae are protected from water current can be controlled by clearing the vegetation as well as maintaining proper gradient.
- ❖ Breeding sites which are associated with rain pools are usually scattered and quite seasonal. As such seasonal use of screens and residual insecticides is quite effective.
- ❖ In cosmopolitan areas mosquitoes breed in artificial water containers such as water tanks, ornamental ponds, cisterns etc. In sites of this nature, breeding can be controlled by introducing larvivorous fishes (such as *Gambusia*), fitting tight covers etc.

Tsetse flies. Tsetse flies are large stout flies with a painful bite and are only found in sub-Saharan Africa. They transmit African trypanosomiasis to people and livestock. The disease condition in human beings is called sleeping sickness while in livestock its referred to as nagana. Tsetse flies feed on a wide range of mammals, birds and reptiles.

In contrast to other insect species, tsetseflies do not lay eggs but give birth to live young ones which burrow into damp shaded patches of soil or leaf litter, where they undergo a metamorphosis into adult flies. In Zambia tsetse mainly feed on big game and cattle. The bushbuck and the buffalo are some of the important hosts of tsetse.

Environmental control methods for tsetse. Generally tsetse flies are controlled by judicious and selective application of insecticides, fly traps and vegetation clearance. In essence tsetse populations are diminished by water resources development, but sleeping sickness can still be a problem if people venture into their habitats such as wooded areas. Chemoprophylaxis is quite effective for groups of people working in tsetse infested areas.

Snails. Certain genera of aquatic or amphibian snails play a role in the transmission of parasites responsible for disease conditions of bilharzia (schistosomiasis). The parasites lodge in the veins of either the intestines or the urinary tract where the eggs are passed in either the faeces or urine. The three principal genera of snails include *Oncomelania*, *Biomphalaria* and *Bulinus* with the latter transmitting urinary bilharzia and the former intestinal infections. *Oncomelania* is only found in Asia.

The eggs of the parasites hatch in water and the mobile larvae (miracidium, pl. miracidia) search and enter aquatic snails. After multiplication, the infective stage (cercariae) are shed after about 3 - 8 weeks. The free swimming cercariae are active in water for about 2 days during which period they can penetrate the skin of any person who comes in contact with them and cause infection.

Modes by which people come into contact with water contaminated with cercariae. Water is made unsafe by contamination with human excreta as a result of sheer ignorance, overcrowding, poor siting of settlements and indiscriminate urination and defecation. Some broad categories of human activity which lead to infection include:

- ❖ Occupation, such as irrigation, fishing and crossing water.
- ❖ Domestic, such as bathing and washing clothes
- ❖ Recreation including swimming and boating

Environmental control methods for schistosomiasis (bilharzia). Bilharzia can be drastically reduced if not completely eradicated if water intake is mechanically screened against snails, and if pollution upstream is curtailed by changing peoples urination and defecation habits.

PRINCIPAL ENVIRONMENTAL ENGINEERING METHODS FOR VECTOR CONTROL

Settlement design. Fencing and zoning pathways e.g. waste disposal sites and recreational sites

Earthworks. Diking and drainage; grading and infilling

Irrigation and drainage design. Steep regular banks; desilting and vegetation clearing to prevent slow water flow and remove food for snails; sprinkler irrigation or intermittent irrigation; increase water velocity without fostering scouring.

Reservoir design. Vegetation clearance; bridged crossing points; straight canals to avoid stand pools; seepage prevention; mechanical screening of water intakes against snails

GENERAL ENVIRONMENTAL CONSIDERATIONS

Safeguards and mitigation measures

Safeguards are interventions which are intended to prevent health hazards from arising. Mitigation measures are meant to make health hazards less severe. Policy makers are faced with a number of options which include alternative interventions.

It is therefore always important to catalogue and articulate the beneficial and detrimental effects, options for interventions, their relative costs and their effects on factors not directly related to health.

Time and stage for sustainable implementation of environmental protection measures

Design Phase

- ❖ Best time for employing safeguards is before the health hazards have set in.
- ❖ The appropriate agency should approve the plan before a water resource development is started.

Construction phase

- ❖ Its imperative that special skill are at hand
- ❖ Ephemeral squatter settlements may mushroom around the site. Human settlement in any form provide ample opportunity for vector breeding.
- ❖ Health and immune status of the construction workers should be ascertained.

Operational Phase

- ❖ The responsibility of health is transferred to the Ministry of Health. nevertheless the planners of the project should be responsible for communicating with the Ministry of Health at an early stage.

OTHER ASPECTS

Evaluating and monitoring

- ❖ Effective scheme for monitoring and evaluating the vector population, disease prevalence and control operation during every project phase.
- ❖ Forecasting and decision making process requires revision in the light of new information.
- ❖ Monitoring must be selective as it requires resources.
- ❖ Monitoring should be started at the right time especially during the feasibility study so that hard data over a reasonably long period (say 1 year) of baseline studies is available before design is finalised.

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POLICY FRAMEWORK AS REGARDS RESOURCES DEVELOPMENT AND ENVIRONMENTAL LEGISLATION IMPLEMENTATION

Chris Kashinga¹

PREAMBLE

The Ministry of Environment was established with the principal objective to control pollution and conserve natural resources. Environmental quality is facilitated by the Environmental Council of Zambia (ECZ) while natural resources conservation falls under the Department of Natural Resources and Forestry.

POLICY FRAMEWORK

There are over twenty (20) Government Ministries which have a direct bearing on the Environment with about twenty eight (28) pieces of different relevant legislation. In formulating the Ministry's policy as regards water resources development projects, the lack of co-ordination between line ministries has been acknowledged. Most of these government ministries are weak in terms of financial resources and manpower; this means that the relevant laws are generally not implemented.

Policy guidelines as recommended by the National Environmental Action Plan (NEAP)

1. The Ministry of Environment and Natural Resources (MENR) must formulate environmental policies and co-ordinate and monitor the implementation of the NEAP by other ministries.
2. A planning unit has been established at the MENR to assist in the monitoring of the NEAP.
3. Environmental Impact Assessment (EIAs) for all projects must be demanded from investors and developers and be evaluated independently. The Environmental Council of Zambia (ECZ) has been charged to perform this task as stipulated in the Environmental Protection and Pollution Control Act (EPPCA) of 1990.

However, further capacity building will be required by the ECZ to perform this role effectively. The ECZ has so far schemed EIA guidelines which are still in draft form. A Workshop has been set for late next month to review the draft EIA guidelines (all relevant ministries will be invited).

4. It is the directive of the MENR that in future the ECZ designates Environmental Officers (EOs) in line ministries and local authorities to ensure that environmental issues are considered during project development.
5. Environmental awareness is crucial for a successful implementation of the MENR environmental policy. The Ministry of Education has integrated environmental education in schools, but no mechanism exists to promote awareness in the business and informal sectors. A national coordinating committee comprising all major stakeholders, should be established in the education unit of the ECZ to promote appropriate education in these sectors.
6. The EPPCA is the principal environmental law, which establishes environmental quality standards for water and air, municipal, hazardous and industrial wastes, pesticides and toxic substances, noise and ionizing radiation.
7. The right to a clean and healthy environment should be included in the constitution.

CONCLUSION

Environmental laws other than the EPPCA are fragmented, sector-biased and sometimes contradictory. Against this background its important that all environmental laws are reviewed and subsequently harmonised with the EPPCA.

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ROLE OF THE COMMISSION IN CO-ORDINATION NATIONAL DEVELOPMENT PROGRAMMES

PAMELA KASASE BWALYA ¹

INTRODUCTION

The National Commission for Development Planning (NCDP) is one of the key economic institutions in the country. With the change from a government-controlled economy to a liberalised one, the role and functions of the National Commission for Development Planning has shifted from that of regulating and directing the planning and implementation process of economic activities to that of key adviser to the Government on various aspects of social and economic policy. This role encompasses the careful monitoring of Zambia's economic reform programme, constant evaluation of the effectiveness of the various economic policy instruments and co-ordination of social sector programmes.

The commission operates under two divisions, the Planning Division and the Development Co-operation Division, each headed by a Permanent Secretary.

The Planning Division has six departments, each headed by a Director. The six departments, excluding administration are: Census and Statistics Department; Macro-Economic Policy Dept; Regional Planning Department; Public Investment Department; Human Resources Planning Department; Women in Development

The Development Co-operation Division has two departments namely Economic and Technical Co-operation, and Regional Co-operation

Through these divisions, NCDP performs the functions of monitoring and co-ordinating social economic activities and mobilising external resources to supplement local resources in national development programmes.

MONITORING AND CO-ORDINATING SOCIAL ECONOMIC ACTIVITIES

The Planning Division of NCDP evaluates the performance of the Zambian economy, co-ordinates human resource development and national gender programmes as well as investments in the social sector and infrastructural development areas. Monitoring of economic performance has become particularly essential in view of the economic reforms and the adjustment programme which the government has been implementing since 1991. The Commission undertakes these roles through the following activities:

- ❖ Economic performance monitoring and forecasting on mid-year and annual basis. This is done through compiling, collecting and analysing statistical data and other related information from a cross-section of the economy.
- ❖ Co-ordinating the design and implementation of population projects and programmes including all population activities in the country. This entails integrating population factors in the overall development process of the country.
- ❖ Monitoring, evaluation and implementation of Public Investment Programmes (PIP).
- ❖ Co-ordinating regional development programmes.
- ❖ Co-ordinating, monitoring and evaluation national gender programmes and sensitization activities. The commission through Women's unit is also responsible for fostering international co-operation and networking between Government, donors and NGOs on gender development programmes.

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The main outputs of the Division are Economic Reports, Public Investment Programme (PIP) Updates, the Directory of Zambian Professional Women and Statistical Publications. These documents are important guides for policy formulation and decision making for the Government, the public, researchers, donor agencies and other interested parties.

THE PUBLIC INVESTMENT CO-ORDINATING DEPARTMENT

The advent of the Third Republic in 1991 entailed re-orientation of NCDP, including the sectoral planning Department which has now become the Public Investment Co-ordinating Department (PID), from a central planning agency to one suitable to the needs of a liberalised economy. Being a constituent part of NCDP, the Sectoral Planning Department was, prior to 1991, responsible for the formulation, preparation, co-ordination and production of the centrally planned five year development plans covering all sectors of the economy.

In the post-1991 economic environment a new role had to be defined for the department, in order for it to make a meaningful contribution to the development of a market-based and decentralised economy. Consequently, the general functions of the department were redefined to include the co-ordination of the analysis of sector policies and the co-ordination, formulation, preparation, monitoring and evaluation of the Public Investment Programme (PIP). The PIP is one of the series of the three-year rolling plans intended to be used as a tool to assist in the efficient allocation of resources into priority areas of public investment through Government Budget and Donor assistance.

It is Government policy that projects which appear in the PIP are presented to donors for assistance as much as possible and this is to ensure that priority projects are given a priority for donor funding. For instance, under health, the priority public expenditure areas (1995-1997) include the following:

- ❖ Restructuring of the Ministry of Health with a district focus;
- ❖ rehabilitation of health Training Institutions;
- ❖ rehabilitation of health facilities;
- ❖ control of epidemics and chronic diseases such as cholera, dysentery, malaria, etc.;
- ❖ flying Doctor Service and high frequency radio communication equipment;
- ❖ university Teaching Hospital;
- ❖ drugs and medical supplies.

Since 1992, NCDP through the Public Investment Co-ordination Department has been involved in a number of task forces that the new Government has set up to address the problems besetting various sectors. The major task forces in which it has been or is involved are the social sectors; the Roads sector, and the Agricultural Sector Investment Programme Task Forces.

In February 1993, the President established the Roads and Social Sector Task Forces to assist the country in the rehabilitation and maintenance of roads and social sectors of health, education, the Roads sector, and the Agricultural Sector Investment Programme Task Forces.

Through the Micro-Projects Unit (EEC) and the Social Recovery Fund (World Bank and other donors), NCDP has funded a large number of community based projects in the social and sanitation obtained application forms from NCDP or regional offices in provinces after which the proposed projects are appraised and approved for funding if found satisfactory. The most important pre-condition for accessing these donor funds is that the community is also required to make a contribution to the project through labour or materials, at least a share of 25% of the total cost of the project.

EXTERNAL RESOURCE MOBILISATION

Through the Development Co-operation Division, NCDP mobilises external aid to fill the financial gap not met by local resources. The external aid mobilised by NCDP is in the form of grants. These grants are used for Balance of Payment Support (BOP), Technical Assistance and project financing. The Development Co-

National seminar on water resources development and vector-borne diseases in Zambia

operation Division also undertakes negotiations for debt rescheduling and forgiveness. Other functions of the Division include promoting and co-ordinating Zambia's regional activities with sub-regional economic groupings such as the Southern African Development Community (SADC), Common Market for Southern and Eastern Africa (COMESA) and the United Nations Economic Commission for Africa (UNECA).

The external resources mobilised by NCDP supports about 70 percent of the Government's capital budget. Requests for external assistance by various Government ministries and departments, NGOs, parastatal companies and the private sector are channelled through NCDP. In this regard, NCDP acts as a clearing house before requests are sent to donors for consideration and approval.

WAY FORWARD

The NCDP will continue to play a crucial role in the country's development in the foreseeable future. To strengthen its co-ordination function a number of activities have been embarked upon these include the following:

- ❖ Synchronization of the budget with the Public Investment Programme so that resources are spent on planned projects in the social sectors and infrastructural development.
- ❖ Institutional capacity building through staff training and streamlining of functions.
- ❖ Mobilising more resources for implementation of planned projects.

PLANNING AND GRZ'S POLICY ON INVESTMENT PROCEDURES AND PRIORITIES

PRISCILLA M. CHITUNDU¹

INTRODUCTION

At independence, Zambia was one of the wealthiest sub-Saharan African nations. Today, the situation is different, the country is one of the poorest in the World with a *per capita* GNP of only \$290 (in 1992). In the early 1970s Zambia relied heavily on planning and administrative controls to manage the economy; on the parastatal enterprises to undertake investment and generate economic growth, and international borrowing to finance public sector investments and to support levels of consumption that turned out to be unsustainable.

Among the different factors which contributed to this decline features the failure of public policy and governance that allowed the decline to continue unabated for two decades. Today, the Government realizes that the process of social and economic development requires that the country's scarce resources are utilized in the most efficient way and in a coordinated manner. The public sector's strategic plans attempt to do this by allocating resources to priority activities.

BACKGROUND INFORMATION ON POLICY DEVELOPMENT

Zambia's initial policy planning was a Transitional Development Plan 1965-1966. The Government started immediately with guidelines for public investment that sounded very much like what came to be known in the late 1970s as the Basic Needs Approach. The declared emphasis was on rural development and satisfactory access of the population to education, water, and health facilities. This plan was followed by five-year development plans spanning the period from 1966 to 1992.

These plans laid emphasis on rural development by expanding agriculture, industry, reducing regional inequalities, developing tourism, and developing water resources.

In the mid-1970s the country's indebtedness rose sharply and the investment situation became desperate. Despite the deepening crisis no substantial policy reform or plan was undertaken to redress the situation. It was thought at the time that the worsening terms of trade were because of the decrease in copper prices and were short-term. As a result, the Government made its biggest mistake by taking temporary measures. It reduced investment and recourse to external finance instead of reducing the level of consumption that was about 80% of GNP (1975-1980) to maintain an aggregate macroeconomic balance.

A decisive change in investment planning took place in October 1983. The Government recognized the need to carry out a wide re-examination of economic policies and institutions at the macro and sector levels. It entered into negotiations with the IMF and World Bank for the first full-blown Economic Adjustment Programme in Zambia. The main objectives of the Programme were on expenditure reduction strategy concentrating on government expenditure.

From 1986-1987, the government broke away from the IMF conditions to carry out an interim development plan, the "Growth from Own Resources Programme". This was followed by the formulation of the Fourth National Development Plan (1988-1992). However, re-assumption of the IMF Programme in 1988, implied that the FNDP could not be implemented at all as it contradicted many of the new policies.

POLICY REFORMS

From 1989 to date, the Government has been implementing a New Economic Recovery Programme. This entails the formulation of the "Policy Framework Paper" (PFP) and the "Public Investment Programme" (PIP). These documents are updated annually.

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At present with the general objective of achieving sustainable human development, the principal development issues in the PFP that will continue to be addressed in the period 1997-2001 cover the following areas:

- ❖ private sector development, employment, and economic growth;
- ❖ establishment of a more efficient public sector and provision of universal access to essential social services such as education, health, water and sanitation and human settlements;
- ❖ maintaining an effective macro-economic management system;
- ❖ establishing a comprehensive national social security that would provide relief and social services to vulnerable groups;
- ❖ containing population growth to levels compatible with growth in *per capita* income;
- ❖ setting up a national environmental action plan to protect and conserve the natural environment;
- ❖ promotion of agriculture and food security;
- ❖ promotion of global and regional cooperation.

The Government has also recognized that local authorities should be able to provide local services, and that delivery effectiveness depends not only on technical competence but also on cost recovery and financial viability. To achieve this GRZ is carrying out a general policy of decentralization and devolution of responsibility to local authorities.

This policy specifically establishes the local water and sanitation service provider's power to operate and provide services in the manner of a commercial enterprise, and to delegate such tasks to the private sector in the view of improving service delivery efficiency and cost effectiveness.

GRZ has introduced Provincial and District Development and Co-ordinating Committees to be in charge of planning and budgeting. The government hopes that this will

1. increase the participation of the population in defining objectives and priorities for investment.
2. bring decision making power closer to the community
3. wean the public sectors from central government financial support.

In developing the water resources of the country, GRZ has decided to reduce the often conflicting responsibilities for the water and sanitation sub-sector of various ministries and agencies (MEWD, MLGH, MWS, MOH, MENR and MCDSS). It has therefore adopted the following principles specifically for the sector in relation to the national development principles outlined above:

- ❖ Separation of water resources functions from water supply and sanitation;
- ❖ Separation of regulatory and executive functions with the sector
- ❖ Devolution of authority to local authorities and private enterprises;
- ❖ Achievement of full cost recovery for water supply and sanitation services through user charges eventually.
- ❖ Technology appropriate to local conditions.
- ❖ Increased GRZ priority and budget spending to the sector.

INVESTMENT PLANNING

Public Priorities and procedures

Each Government prepares a priority public investment Programme (PIP), as part of the budget preparations.

The investment priorities are therefore highlighted in the PIP, which is a three-year rolling plan with yearly reviews. The Programme is supposed to be consistent with the resource availability and growth targets of the PFP.

At present the Government's attention is directed towards the social sectors- health, education and training, and water supply and sanitation. The Government, with the assistance of UNDP, formulated the Social Sector Rehabilitation and Development Programme 1993-1996. This Programme is estimated to cost K244 billion. The estimate is inclusive of donor support (K53 billion) during the period up to 1996. The estimates are as follows:

Component of the SSR and D Programme	Billions of Kwacha
Health and Nutrition	67
Education, Science and Technology	81
Water and Sanitation	76
Women in Development	4
Social Safety Net and Social Security	18

Priority is also given to economic sectors, namely Agriculture, Energy, and Transport and Communication. This is in line with the objective to provide support services and infrastructure for private sector-led growth.

Within the stated priorities, GRZ is concentrating resources in the following areas: emergency assistance; rehabilitation; maintenance of existing service coverage; increasing coverage to reflect population growth; coverage to reduce the backlog of unserved population.

In the 1994-1997 period, government plans to invest a total of 131 967.430 million. Plans are to continue providing water services to drought prone areas of Eastern, Central, Lusaka, Western and Southern Provinces (including the construction of small dams in these areas).

It is expected that with the current tax, civil service as well as the privatization programme reforms, an increasing proportion of the PIP will be financed from domestic sources and only supplemented by external sources. These increased investment resources will be directed towards the development of the social and economic infrastructure.

In order to strengthen and streamline government machinery for project planning, evaluation and review, GRZ will ensure that sectoral planning activities fully subscribe to the objectives and operational targets of the PIP resource allocation process. To ensure that the PIP stays within the broad framework of resource availability in the short and medium term, GRZ is making efforts to improve fiscal discipline, particularly expenditure control and performance auditing of projects. This has been done through the introduction of reforms to both the budget process and the PIP. Both of which are to be contained in the Medium Term Plan and Forward Budgeting (MTP&FB).

The MTP&FB is a vital tool for ensuring that the pattern of public expenditures is consistent with stipulated national objectives, to determine and prioritize between the various possible components of the investment programme. Its formulation takes cognizance of the work started within NCDP on a National Long Term Perspective Study (NLTPS). MTP&FB will be a cooperative process allowing a multiplicity of actors to be involved in setting the policy environment for a downsized public sector operating in a liberalized, market oriented economy.

To ensure that resources shift to priority areas, the MT&FF recommends that share totally allocated to the social sector rises from 40.5% in the 1995 budget to 42.0% by 1998, that the share to the economic sectors increases from 18.8 to 20.5% while the share for administration falls from 40.6 to 37.5% by 1998. As part of MTP&FF efforts have been made to reorganize the data collection and monitoring procedures.

THE INSTITUTIONAL FRAMEWORK

Government has realized that the development of water resources will need coordinated investments in health, water and sanitation and environmental sectors. It has thus approved the establishment of a "Water Resources Board" comprising of MOH (water quality), MAFF (water re-use) and NEC (pollution control).

GRZ's policy is that general resource management remains with central government while operations and maintenance of schemes become responsibilities of local authorities, mostly water companies.

The country's central bodies NCDP, MOF and BOZ, and Cabinet Office, coordinate and monitor all planning activities done by other institutions.

At Provincial and District level, the District Development Coordinating Committee (DDCC) are supposed to receive proposals for regional investment/development programmes from the communities, government departments and NGOs. In line with District priorities the DDCC should select investments that will be undertaken. The successful proposals are then presented to a planning sub committee of the DDCC which, reviews them and compiles a draft consolidated programme for the District. The programmes are then sent to the PDCC's planning sub committee for scrutiny for conformity with the stated criteria and observance of national government policies. After the PDCC approves their sub committee's programme, it is submitted to the national level for funding.

At National level, NCDP is the institution responsible for the coordination of the PIP, its drafting and monitoring. The Institution assesses the quality, realism of individual plans and the capacity of implementing them. It ensures that these are within government's priorities, the coherence with sectoral strategies and macroeconomic framework and the mobilization of financial resources.

Policies will not only address cost recovery issues, but provide for the establishment of effective financial management and control, such as accounting, internal auditing, billing and collection, contracting, procurement and disbursement.

Private investment (for Procedures see appendix I)

Government has committed itself to enhance the Private Sector instrument, which it sees as an engine of economic growth. It is currently taking elaborate measures in enhancing private and foreign investment. Instruments such as the exchange rate, pricing, tariff and others make important contributions in providing an environment conducive to new investments. Trade policies have also been liberalized and a flexible foreign exchange policy has been introduced, while a stock exchange and capital markets have been established.

Despite the above measures, water resources can not easily be rested in private hands without strict regulatory mechanisms, especially, as the sector has public health and environmental implications. Government interventions is also required to ensure that services are extended to the less privileged, that best use is made of resources. The private companies will therefore have to adhere to standards and guidelines set by national regulatory bodies.

CONCLUSION

Zambia has gone through various phases of planning. The GRZ's policies on investments have seen an increasing shift from the centralized planning with Government actively involved in the provision of goods and services to a more liberalized, market oriented economy. The government's role is now limited to coordinating the Country's development policies, while the private sector now takes the leading role in providing services.

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APPENDIX I

INVESTMENT PROCEDURES FOR PRIVATE INVESTMENT

Any person wishing to invest in the private sector should follow the procedures below:

1. The investor should obtain the necessary licenses, authorizations or permits from the relevant ministry or body
2. The Investor should then apply for an investment certificate to the Investment Center (IC) and pay a non-refundable fee determined by IC. The application will be presented to the IC Board, which within six week of receipt of an application issues the certificate or rejects an application. The application can be rejected if it is not in accordance with the provisions of the investment Act and if the investment to be undertaken contravenes any laws and regulations of the country.
3. Should an applicant not be satisfied with the Board's decision, an appeal can be lodged to the Minister subject to a further appeal to the High court.
4. The investor is subjected to the conditions laid down in the certificate, which can be varied should it be wished. This can only be done during the validity to the certificate.
5. Should the investor be unable to commence operations within twelve months from the date of issue, an application to the Board for period extension can be made. This application should be presented at least sixty (60) days before the expiring date, giving reasons.
6. Where the investor decides not to continue with the programme to which the certificate relates, he/she shall notify the Board in writing and agree to the terms and conditions of the surrender of the certificate.

APPENDIX II

Several ministries share the responsibility for the water. Their function are as follows:

MOH -sets and monitors water quality standards, and provides health and hygiene education

MENR -pollution control standards and monitoring their implementation at Provincial and District levels

MCDSS -assisting rural communities organize for water and sanitation development. Monitoring the impact of rural water supply and sanitation activities through the Community Management & Monitoring Unit.

MWS -responsible for institutions' water supply and sanitation (sewage treatment) for some district centers.

MEWD -water resources planning and management

MLGH -assisting and supporting local authorities in the provision of water supply, sanitation and other municipal services as well as the actual implementation.

NCDP -overall planning, determination of inter-sectoral investment priorities, donor co-ordination and monitoring of executing agency performance.

HEALTH ISSUES POLICY AND STRUCTURES OF THE HEALTH SECTOR

S.T. CHISANGA

INTRODUCTION

Available evidence extracted from studies carried out in Zambia vindicate a popular view that water resources development and management could be and has been a source of serious health consequences if executed merely as an engineering feat without due regard to health issues.

Incidence of malaria for example, at sometime in the history of the country, was restricted only to some areas. Urban areas in particular, virtually attained the status of being malaria free. It is argued that this was achieved because of a multifaceted approach to environmental management that drastically reduced the habitat suitable for mosquito breeding. Today malaria ranks as health problem number one responsible for most morbidity and mortality in the country.

TABLE 1: MALARIA'S ANNUAL INCIDENCE RATES 1982 - 92

YEAR	CASES	RATES/1000 POPULATION
1982	1,008,094	167.51
1983	1,287,621	207.52
1984	1,451,399	226.88
1985	1,557,267	231.55
1986	1,515,410	217.49
1987	1,530,733	211.78
1989	1,993,262	287.89
1990	1,933,696	259.71
1991	2,340,994	290.06
1992	2,953,629	353.61

The increase in malaria incidence over the years as shown in the above table (and to be considered alongside population growth), has, at least in the urban setting, been against the backdrop of increased unplanned and unregulated physical development, defiant of sound environmental management. Apart from such developments severely restricting free flow of water in its natural courses, they have encouraged uncontrolled quarrying, indiscriminate strewing of litter, discarded containers and derelict structures that afford breeding in the little quantities of water they are able to hold. Naturally these have combined with other factors to worsen the incidence.

Another notorious disease associated with water resource development is schistosomiasis. It is prevalent throughout Zambia with prevalence rates ranging between 4.1/1000 to 23.2/1000 across the country. The mean prevalence is at 11.6/1000. It is an insidious disease characterised by a chronic, debilitating effect on its victims. Although it affects so many people and certainly has an adverse effect on the economic performance of those affected, its impact on public health is, perhaps, not readily appreciated.

There are several other diseases transmitted by vectors associated with water, but malaria and schistosomiasis require special mention.

Water resources development, particularly to enhance agricultural development through village level irrigation schemes, has not been exploited to its full potential. But given the extreme difficulties in food supply caused by continuous droughts interest has been aroused in exploiting the abundant water resources to mitigate hunger and poverty. Time to arouse probable health problems with such schemes is now so that appropriate

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measures that enhance suppression of some of the known disease problems are incorporated in the designs. Otherwise the risk of the schemes contributing to disease proliferation is inadvertently promoted.

Zambia's water resources are derived from the rains which fall mainly between November and April and collect in lakes, swamps and rivers dotted and criss-crossing most of the country. The average annual rainfall is 1000 mm, almost all of it falling during the rainy season of between November and April.

The northern parts of the country usually record higher rainfall than the national average, with a gradual decrease to below average towards the south. Southern Province, for example, has on record an annual average of 730 mm.

Ground water recharge takes place during the rainy season with the highest ground water levels being recorded between March and April and the lowest in October and November.

Underground water utilisation does not appear to have been exploited to a great extent and offers potential for future development.

Water is life, a saying goes. Indeed, the whole microcosm of life much revolves around water. Such aspects as its quality, utilisation and the entire spectrum of its management, all have either by design or default, an impact on life as we understand it. Much as it firmly supports human life, it also supports several other ecosystems, some of them posing risks to, among other things, public health.

Over the years, man has tried, and continues to this day, to understand adverse effects of water on life. This is so that he can, on the other hand, derive greater benefits out of any water resources development scheme, better still, that if appropriate and sound environmental engineering is incorporated within, mitigation of likely health problems is ensured.

Water resource development schemes by their nature, aim at adding to an improved quality of life. Most benefits could only accrue however, when possible health risks associated with any particular development are critically considered and provided for.

WATER AND HEALTH ISSUES

Historical health catastrophes associated with water have either been due to its quality, quantity or nature of the creatures it has supported and their propensity for disease.

When a common source for water supply is inadvertently polluted, the community deriving its water from that source ends up acquiring and developing dangerous diseases, characterised by short onset and affecting a lot of people almost simultaneously. If the source of the problem is identified quickly and appropriate interventions applied immediately the end to the disease problem is almost as dramatic. Among such diseases are cholera, dysentery and several other gastro-intestinal problems.

The quantity of water available will affect man differently. For example, little water in a home will adversely affect personal hygiene and consequently impact on the quality of life. A drought, as we are experiencing, will considerably affect the economic fabric of a country as affected communities lose virtually all their economic base invested in a failing crop and dying animals ! An unusually heavy and protracted down pour does not only wash away homes creating destitution, but also destroys considerable economic structures with dire consequences on health. Zambia has had her share of flooding in the recent living memory.

On the other hand, ineffectively managed water bodies, give rise to such creatures as mosquitoes, several other types of arthropods and snails, that quickly become not only of nuisance value, but intermediary in the transmission of some of the major health problems. In Zambia today such diseases as malaria, schistosomiasis and malnutrition exacerbated by poverty and crop failure due to drought, account for over 70% of the health problems. It therefore makes a lot of sense that the design of water resources development schemes focuses on health concerns during the formulation and design stages.

NATIONAL

Health policies

AIMS: The national health policies aim at "providing Zambians with equity of access to cost-effective quality health care as close to the family as possible". The concept recognises the fact that improvement of accessibility to health services and reduction of mortality and morbidity is not enough to provide quality health care, but also the improvement of the quality of life of all Zambians in general. Main determinants in this regard include environment, lifestyle (behavioral), socio-economic, cultural and political factors and health services

Achieving a healthy society is not a medical issue but rather a political and socio-economic one. Accordingly, the policies stress the need for intersectoral collaboration, in particular with other ministries. The Ministry of Health, however, shall strive to promote preventive, promotive, curative and rehabilitative services as a major strategy for achieving health for all with the individual taking responsibility for his health.

Among the health goals targeted by the National Health Policy are:-

- ❖ Achieving equity in health opportunities
- ❖ Increasing the life expectancy of Zambians
- ❖ Creating environments which support health.
- ❖ Encouraging lifestyles which support health
- ❖ Providing quality assured health services
- ❖ Promoting individual and family health through efficiently administered population control activities.

Some of the specific strategies identified cardinal to the creation of environments supportive to health include ensuring safe working environments which support health, and ensuring safe physical environments and health supportive habitats

The National Workshop on creating awareness among senior institutional officials concerned with water resource development and government coordination, is but fitting testimony of the desire above.

Structures

In accordance with the recently enacted Health Services Act of 1995, provision and delivery of health services are in the process of being decentralised to the districts under district health boards. All curative services shall be the responsibility of the boards while environmental health services, such as creating environments supportive to health, shall continue to be a delegated responsibility of the local authorities.

The Act has further created the Central Board of Health which shall be responsible for the day to day management and provision of health services by way of monitoring the operations of the district health boards.

Public health laws relevant to water resources development

Given that there are several statutes that regulate various aspects of public health, perhaps the most pertinent to water resource development and management are the Public Health Act and the Examination of Mosquitoes Act. In their broad provisions, they each refer to mosquito control in relation to water resource utilisation. It should be so managed that it does not encourage mosquito breeding.

MITIGATING HEALTH PROBLEMS ASSOCIATED WITH WATER RESOURCES DEVELOPMENT

Attaining sustainable mitigating measures against health hazards that may arise out of any water resource development requires awareness of the designers of schemes, engineers and managers. This could be one of the ways to ensure appropriate mitigating measures are incorporated at appropriate stages and levels of development.

Many Government Projects rarely get plans submitted to planning authorities scrutiny. Inter-ministerial consultations are equally rare.

It may be useful in future, to develop strategies for mandatory inter Ministerial scrutiny of plans relating to water resources development in particular so that concerns are addressed appropriately and adequately.

CONCLUSIONS

Given that Zambia's disease pattern is 70% due to preventable conditions, and such specific health problems as malaria, schistosomiasis diarrhoea and malnutrition are largely preventable through sound environmental management, and recognising the fact that effective preventive measures are multi-sectoral in nature, the Ministry of Health can only lead the advocacy. Otherwise promotional measures require inter-sectoral collaboration and inter-disciplinary action.

Developers, too, need to acquaint themselves with regulatory controls available with various regulatory agencies so that schemes do not inadvertently end up disadvantaging the very communities they aim to support in the first place.

It is therefore to be hoped that when the seminar on creating awareness on water resources development and vector-borne diseases is over, and the participants are back in their routing functions, they will give a thought to health concerns when a water resource development scheme is brought before their attention. Sound environmental management is a matter for all disciplines and sectors.

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**CONSIDERATIONS AND GENERAL OVERVIEWS ON
IRRIGATION AND OTHER AGRICULTURAL WATER USE AND
PUBLIC HEALTH IN SELECTED CASES IN ZAMBIA**

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Abstract: While the 50 000 hectares of irrigated land in Zambia are seemingly little when compared to a potential irrigation area which is estimated at 500 000 hectares, problems of health related to water are still very prevalent.

In the Nakambala Irrigation Sugar Estate, with a 10 000 ha sugar cane plantation, the incidence of malaria and bilharzia are of endemic proportions. Lack of properly designed drainage outlays has greatly worsened the situation. The drainage recharge in the Kafue river from the Nakambala Sugar Estate introduces in the river system many elements that, apart from having toxicological effects, have the effect of changing the biological fauna in the river system. We must therefore be concerned how much solubles, pesticides, herbicides and insecticides the 10 000 hectares of sugar cane will bleed back into the Kafue river system.

In recent years the multipurpose dams, reservoirs and weirs which were created for drought mitigation have suffered the adverse effects of a prolonged hydrological drought. Consequently, many reservoirs have for many years not received the necessary hydraulic flushing through the spillways and many have therefore been reduced to fetid entities acting as habitat and depositories for diseases and vectors.

In the third scenario the assessment looked at the case of irrigation practices in the Ngwerere River system. The river system utilises the waste water effluent from the Lusaka Sewerage and Water Company to augment the natural flows of the river. This inflow from the sewerage works has far reaching implications in terms of water quality.

With persistent drought, natural dilution in the river system has been severely reduced to detrimental levels. In most cases heavy metal pollution is a cause for much concern. The continued use of Ngwerere river as a source for irrigation water should be critically reviewed by all interested parties. Concern should address the type of crops, microbes, heavy metals and the long term effect of the above to the consumer.

It is apparent that the policy frame work of the Ministry of Agriculture, Food and Fisheries has not yet created compatibility with the government organisations and other stake holders that deal and have bearing or interest to the water-soil- and plant relationship. There is for instance no link between the Bureau of Standards and the Ministry of Agriculture, Food and Fisheries in their quest to formulate agriculture standards. Inter-linkages and liaison with the many interested parties will ensure that the Irrigation Projects will be planned properly and correctly and can bring about an improvement in the general public health in a number of ways.

However, the derivable benefits are not easily achieved and indeed many irrigation schemes have frequently been associated with deterioration in public health. Irrigation, for instance, will ensure or bring abundance of water which would rid the people of common diseases like trachoma and scabies. However, as a side effect the water may act as a vector habitat and transfer media for a host of disease-causing organisms.

The major diseases of concern in Zambia could be classified according to the causal agent and are typical of the tropical environment, the sub-humid region to which Zambia belongs.

Transmitted by mosquitoes - malaria, filariasis, yellow fever, dengue haemorrhagic fever and equine encephalitis.

Transmitted by the *Simulium* fly - onchocerciasis, the cause of river blindness.

Transmitted by tsetse fly - African trypanosomiasis, also commonly known as sleeping sickness.

Borne by snails, include schistosomiasis, commonly known as urinary or intestinal bilharzia and paragonimiasis and distomatosis (liver fluke) and chronorchiasis (the human liver fluke).

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AGRICULTURAL POLICY OF THE MINISTRY OF AGRICULTURE, FOOD AND FISHERIES

It is necessary to review the policies of the Ministry of Agriculture, Food and Fisheries so that an inference can be made to their role in the water development for agriculture in this country. In 1992 the Ministry of Agriculture, Food and Fisheries (MAFF) established a frame work for agricultural policies to the year 2000 and beyond. This culminated in the statement of October 1993, and laid a foundation for long term agricultural direction in the country.

Long-term agricultural policies

The long term agricultural policies as outlined in the statement of October 1993 sets out the following five objectives and further prioritised ten strategies for achieving the objectives.

Objectives

To ensure national and regional food security through dependable annual production of adequate supplies of basic food stuffs at competitive costs.

To generate income and employment to maximum feasible levels in all regions through full utilization of local resources and realisation of both domestic and export market potential .

To contribute to sustainable industrial development by provision of agricultural industrial raw materials.

To significantly expand the sectors contributions to the national balance of payments by among other sectors, expanding agricultural exports in line with international comparative advantages.

STRATEGIES

To achieve the objectives outlined above the following strategies were formulated.

- ❖ Liberalisation of markets
- ❖ Crop diversification
- ❖ Emphasis on provision of service to small holders
- ❖ Development of the livestock sector
- ❖ Emphasizing sustainable agriculture
- ❖ Expanding opportunities for outlying regions
- ❖ Making full use of land available for agriculture
- ❖ Making full and improved use of available water resources
- ❖ Improvement in the economic status of women
- ❖ Helping farmers deal with natural disasters

AGRICULTURAL SECTOR INVESTMENT PROGRAMME (ASIP)

The formulation of agriculture objectives and strategies above further culminated into a short term five year agricultural sector frame work of action. ASIP aims at narrowing the long term objectives and strategies to a five year programme with the following main components: (i) policy and institutional reforms; (ii) support for private sector investment; (iii) rehabilitation and strengthening public sector agricultural services. The action oriented components above will lead to the following ASIP policies and institutional reforms which are mainly characterised by a moment away from a centralised command economy to a liberalized market down economy; (iv) creation of the food security agency to ensure 2.5 million bags of cereals; (v) restructuring of three institutions lending to the small scale farmers; (vi) revamping land tenure arrangement; (vii) restructuring of Agriculture Food and Fisheries and the Ministry of Lands; (viii) phasing out agricultural credit subsidies; (ix) completing the privatisation programme; (x) establishing an Agricultural Training Board; (xi) revising and updating agricultural legislation

Private sector investment

From the onset the deliberate intention of the government was to liberalize the economy with a view to foster and encourage private business initiative. The targeted elements in the private sector investment include leasing of crop storage facilities, crop market revolving fund, production credit revolving funds, new products (or export) development and social credit programme for venerable groups

It is clear that the aspect of environment and health does not feature clearly and openly in the investment targets.

ASIP sub-programmes

In order for ASIP to address and cover as many sub-sectors of the agricultural major sector, the following ASIP sub-programmes were muted and put forward after extensive and intensive people from all walks of life. Therefore ASIP will address several sectors among which the following: policy planning, extension and information, irrigation, fisheries, farm power and mechanization, agricultural research, animal production and health, marketing and trade, food security and nutrition and new product development

Objectives of ASIP

While, initially, the ASIP programme will be donor driven for five years with the following imposed conditions: donor aid will decrease gradually and terminate at the end of five years; ASIP must be sustainable using only GRZ resources after the five years period; and, a rate of growth of 6% in agricultural GRZ must be achieved while reducing GRZ expenditure on the sector to not more than 1.5% of total GRZ.

IRRIGATION SUB-PROGRAMME

Significant to the ASIP programme and of much relevancy to the seminar objectives. The Irrigation Sub-Programme is one of the sub-programmes of the ASIP. Within the context of ASIP the Irrigation Sub-Programme has developed its own objectives and strategies which are outlined below.

Overall objectives

The overall objectives of the irrigation sub-sector are as follows:

To increase income at national and household levels.

To contribute to increased food production by increasing the crop outlet per unit area in combination with rainfed agriculture.

Specific objectives

The underlying principle is to encourage the use of irrigation so as to improve farming profits and reduce the risk associated with rainfed agriculture. The specific policy objectives therefore are:

To promote economically sustainable irrigation systems among small and large scale farmers.

To expand the area under irrigated agriculture and contribute to increased crop production.

To improve income generation among irrigation farmers.

Strategies

Government strategies for achieving irrigation development will be directed at enabling farmers to take advantage of the existing irrigation potential to increase farming profits and reduce the risk of financial losses associated with rain-fed agriculture.

The above stated objectives will initially be achieved through the strengthening of the IES and make it effective in servicing the small-holders on schemes as well as other individual farmers. Other strategies for

the sub-sector will be directed at eliminating those factors which have hindered the development of irrigation in the past. The specific strategies which will be employed are as follows:

- ❖ To develop a National Irrigation Water Master Plan in order to ascertain the actual irrigation potential in the country.
- ❖ To strengthen the institutional capacity in IES and enable it provide an effective irrigation service and training to farmers.
- ❖ To encourage and support the extension of the National Electricity Grid to potential irrigation areas where economically feasible.
- ❖ To support the development of economically sustainable irrigation infrastructure such as multi-purpose dams.
- ❖ To review streamline procedure for granting water rights.
- ❖ To encourage the development of smallholder irrigation scheme where socially and economically viable.
- ❖ To provide technical and extension services to small scale farmers in rural areas.

Irrigation sub-component specialized units

To improve the delivery of the technical services to the public and private sector in the context of ASIP, it is intended that the Irrigation Functional sectors will be divided into the following components:

Hydraulics/Civil Structure Unit. This unit will aim at achieving the following specific objectives within the rural objectives of the irrigation sub-programme:

- ❖ to develop and provide credible irrigation structures designs and plans for public schemes and the private sector;
- ❖ to promote, research and develop water lifting devices to benefit the small scale farmers;
- ❖ to create and develop irrigation and water structures design standards for Zambia;
- ❖ to provide advisory and extension service on irrigation technology to public schemes and the private sector;
- ❖ to develop and operate a computer aided design with a storage and retrieval capability in order to standardize and improve the quality of design maps and plans output;
- ❖ to collaborate and liaise with other institutions in civil/hydraulics development and research;
- ❖ to train farmers in operation and maintenance of irrigation civil structures.

Irrigation Agronomy Unit. The irrigation agronomy unit will be involved in the aspects of the water-soil-plant relationships. The unit will therefore endeavour to meet the following unit objectives:

- ❖ to develop crop water requirements for the various crops in the different economical zones of Zambia;
- ❖ to collaborate for Zambia, the soils to crop compatibility relationships;
- ❖ to develop soil moisture characteristic models using principles of soil physics for the various soils in Zambia;
- ❖ to develop a computerised data bank of crop water requirements for the various crops in Zambia.

- ❖ to advise, assist in policy development for irrigated crops and lands in Zambia;
- ❖ to offer extension service to the public schemes and private sector on irrigation;
- ❖ to conduct training in irrigation agronomy for GRZ staff and farmers;
- ❖ in liaison with farm management section, policy and planning, to develop irrigation economic arm budgets for the various crops and irrigation systems.

Catchment Hydrology Unit. The agricultural hydrology unit under irrigation will cover all aspects of climatic inputs into the irrigation environment. It will therefore endeavour to meet the following objectives:

- ❖ to collect process and analyze climatic data related to irrigation planning and design some of the data that is required include rainfall, run-off, temperature, humidity and growing degree days.
- ❖ to study the potential water sources in Zambia and relate this to the feasibility of the hydraulics unit;
- ❖ to develop a data bank of water sources and climate in Zambia and to relate these to the potential irrigation land in Zambia;
- ❖ to collect the water/climate/land relationship;
- ❖ to develop a National Irrigation Master Plan;
- ❖ to liaise and collaborate with the Department of Climatology and the agro-chemical section in particular, the department of Water Affairs and many other relevant bodies;
- ❖ to review and collaborate part of irrigation and water basin studies in Zambia. Further guide all future studies on irrigation in Zambia.

IRRIGATION ASIP SUB-PROGRAMME

Within the context of ASIP the irrigation sector established the following seven strategies aimed at encouraging farmers to take advantages of irrigated agriculture.

- ❖ National Irrigation Master Plan, which, as a forerunner to the national Water Master Plan will ascertain the actual irrigation potential in Zambia.
- ❖ To strengthen the institutional capacity of the irrigation engineering section to carry out effective technical extension services and training to farmers.
- ❖ To encourage, influence and support the extension of the electricity to the identified and verified irrigation areas.
- ❖ To support the development of irrigation in multi-purpose water development projects like dams.
- ❖ To review and streamline procedures for granting water rights.
- ❖ To encourage the development of small-holder irrigation schemes where socially and economically viable.
- ❖ To provide technical and extension services to small scale farmers.

Specific objectives of the irrigation sub-programme

The specific objectives of the irrigation Sub-Programme will address the detailed aspects of the irrigation sector in terms of how it relates to the farm level and the recipient farmers whether private or public sector.

Rehabilitation and completion of GRZ public schemes

The planned rehabilitation and completion of the public schemes is presented in the table below:

Scheme	Hectares
Buleya Malima	57
Chaputa	60
Chipapa	10
Ipafu	80
Nkandabwe	10
Lusowe	10
ukuzye	7
Siatwiinda	22
Vuu	13
Makuugwa	22
Mulumbi	100
Lukulu	100
Total	419

The completion and rehabilitation of these schemes will have a significant influence on the communities they serve especially in terms of water and health. While the hectares may seem small, their contribution to the well being of the communities they serve is very significant.

PROJECTION OF IRRIGATION DEVELOPMENT

For irrigation to influence the agricultural GDP the irrigation development is targeted at the scenarios based on the following figures: 52 727 ha (1993), 102 560 ha (2005) and 138 800 ha (2015). Project area increase is therefore foreseen as 49 833 hectares between 1993 and 2005 and 86 073 hectares between 1993 and 2015.

Potential sites for irrigation

During the National Master Plan Studies (JICA, 1995) the following dams were identified which could be developed to enhance the irrigated area in the country. The dams are categorised in their use category

(i) **Multi-purpose Dams - 6 250 Ha**

Chongwe
Mutundu
Kafubu

(ii) **Irrigation Dams - 3 200 Ha**

Kapyanga
Lundazi
Bweengwa

(iii) **Run of River potential sites - 3 383 Ha**

the development of dams and resources will increase the total irrigated area to 120 833 hectares. This increase will have to match both measures for quality standard and environmental considerations.

LIVESTOCK DEVELOPMENT AND WATER USE

As with irrigation, the strategies of ASIP with respect to the livestock sector is to increase the livestock population in the agricultural sector. The livestock development plan under ASIP aims at the following development scenarios:

- ❖ Plan 1: to expand cattle breeding to other flood plains other than the Kafue. The potential flood plains include upper Zambezi, Chambeshi and Luapula plains.
- ❖ Plan 2: to produce meadow grass by means of irrigation for excess cattle in the Kafue flood plain in the dry season.
- ❖ Plan 3: to combine expansion to other flood plains to meadow grass production by irrigation.

Cattle population projections

	1990	2005	2015
Heads of cattle	2 668 512	3 789 288	4 616 525

Cattle Water Demand by Province

PROVINCE	1000M ³ /DAY	1000M ³ /YR
Lusaka	8 496	3 101 000
Copperbelt	12 466	4 550 000
Central	33 725	12 310 000
N/Western	12 698	4 635 000
Western	42 927	15 668 000
Southern	61 172	22 328 000
Luapula	4 374	1 597 000
Northern	21 868	7 982 000
Eastern	25 000	9 140 000
Zambia	222 769	81 311 000

Source Yearn (YEC 1995)

It is projected that irrigation of 94 800 ha of meadow grass by the year 2015, 2/ha/head would support at 95M³/S of irrigation above 780 000 cattle which would leave about 1 260 069 cattle grazing the natural belt. The cattle population therefore consumes about 222,766 M³/day equivalent to 2.6 M³/S which would be about 1.76% of regulated flow in the Kafue river.

It is clearly evident that the pressure on the water supply will be on the increase with projected increase for livestock and irrigation. The daily animal water requirement for the livestock is as summarised below.

Unit water consumption of livestock

Cattle	40 l/day
Pigs	20 l/day
Sheep/Goat	20 l/day
Poultry	0.21/day

Therefore, the cattle population will be consuming the water supply at 2.3 M³/S /by the year 2015. The majority of cattle in the dry part of Southern Province will be supplied by multipurpose dams. The demand on minor river systems and streams and the multipurpose dams has been under severe pressure as source of water became scarce. With the combination of hydrological drought and over-abstraction, the disease potential is on the increase.

CASE STUDIES

The paper now looks at three situational cases that do indeed provoke thoughts for agricultural water use and health.

SUGAR ESTATE

The Sugar Estate irrigates over 10 000 ha of a variety crops but dominated by sugar cane. The crop water requirements for the main crops that are grown in water use are listed below.

Water requirement by crop		
CROP	ZONE II in M³/ha	ZONE V in M³/ha
Sugar Cane	15 700	22 200
Cabbage	8 000	12 600
Citrus	11 000	14 700
Onion	11 000	11 000
Tomato	15 900	18 000
Wheat	9 900	10 400
Fish Ponds	10 300	14 300

In general for the purpose of design and planning the peak irrigation requirement is 0.95 L/S/ha in zone II, 1.0 L/S/ha in zone IV and 0.95 L/S/ha in zone VI

It is also estimated that the seepage losses from the the irrigation systems are about 4.03 M³/S from the 23% of regulated Kafue river flow. This amount of recycled water which by then will be rich in nitrates, herbicides, pesticides and insecticide and other pollutants, is definitely a long-term concern for irrigation project planners of the Kafue river basin.

Present irrigated area in the dry season in hectares

Total Irrigated Area	58 700
Commercial farms	36 430
Projects	22 270
Small-holder irrigation projects	277
Medium scale irrigation projects	1 693
Large scale irrigation projects	20 300
Total	58 700

Concerns on water, following the overview of agricultural policies and water for agriculture, stand out as follows:

- ❖ The projected increase irrigated agriculture and annual populations will increase the pressure on the water resource which will concomitantly increase the water-related disease potential.
- ❖ The prolonged hydrological drought has reduced the available water supply and quantity. Hydrological drought has compromised the water quality and quantity in many river systems and other man made supplies like the multipurpose dams. The Ngwerere river water receives 31 000 M³/day of sewerage effluent without high natural flows; due to drought the water quality has therefore severely deteriorated.

OBSERVED CASES

To accurately estimate the impact of agriculture on water-borne diseases, the following scenarios were analyzed to illustrate the cause-and-effect relations.

Sugar Estate water-borne pollution potentials

Sugar Estates irrigates 10 000 ha from the run-off river system abstracting water at about 257 000 M³/year; 23 % of this water input (36,000,000 M³/YR) is recycled back into the Kafue River -solubles, surface water in reservoirs and drainage can also have potential to increase the water borne disease and other agricultural pollutants in the system. Figure 1 at the end of this paper illustrates the water balance in the river system.

Multipurpose Kanchele dam and water-borne disease potential

The population of cattle is on the increase and in the year 2015 will demand or consume 2.3 M³/S. This demand for water by livestock is of significant importance in the dry belt of the country in the South Central and Western provinces where several multipurpose dams were built to mitigate the effects of hydrological drought on both people and livestock. In a given area in these days of drought, the dam and its reservoir has become an oasis for man and beast. Potential diseases are in part related to animal excretra and urine which increase the microbiological activity in the water body. There is a potential for anthrax, viral and parasitical faecal pollution, hook worm, dracunculiasis, mosquito breeding sites (therefore malaria), intestinal bilharzia and liver flukes etc. Due to severe hydrological drought, the dam reservoirs have been reduced to fetid water bodies.

The Ngwerere River System

The Ngwerere River System forms a unique case of the augmentation of a natural river flow by an input from the Lusaka Water and Sewage Company Ltd. The company delivers into the natural reservoir of the Ngwerere river about 31 000 M³/day of effluent from their maturation ponds.

Water Rights Demands

In the Ngwerere stream ha meant that demand has, of late, far outstripped the river flow, even with the inflow effluent or waste water from the LWSC. The current water rights on the river system is as summarised below.

Water Amount M ³ /Day	
Chamba Valley	4 000
Chamba Valley	5 000
Chamba Valley	6 000
Roan	5 000
Ngwerere	4 120
Diamondale	7 000
Ellensdale	10 000
Bondale	7 000
Kalimba	250
Simpson	284
Walter	100
Buccaneer	800
Bonanza	1 000
Kasisi Mission	272
KATC	800
Airport Farm	7 000
Kasondi	2 000
Total	60 626

This demand is equitably met during a normal average irrigation season. The hydrological drought has also reduced severely the ability of the river to dilute and modify the chemical and biological quality of the water in the river. The drop in quality is at its lowest during the peak irrigation month of October. A further concern is the suitability of the water for the irrigated crops.

Discharge Measurements for Ngwerere at the Estate Weir were measured as follows:

Date	Flow M ³ /Day
30/03/94	34 784
25/04/94	34 016
11/05/95	17 280
16/05/95	26 780
22/06/95	30 758
Average Flow/Month	28 724

It is clear that at this time of year the major and probably the only source of water for the Ngwerere River is the waste water from the LWSC treatment works. This therefore raises many water quality concerns. The fluctuation within the same month indicates that the flow is externally controlled at the release points of the maturation ponds.

CONCLUSIONS

The irrigated area in Zambia will increase substantially towards the year 2015. This will increase the demand on the water supply from the river systems especially the Kafue River Basin which will increase the chances of water-borne disease within the irrigation environment. There does not seem to be any direct and well defined institutional linkages in the water sector and this situation has to be corrected if the water resources has to be fully exploited and sustained quantitatively and qualitatively. There must be a deliberate effort to harness and develop water resources especially in times of drought in order to mitigate the hydrological droughts and the associated disease situations.

Where the demand for water outstrips the supply, like in the case of the Ngwerere river, the aspects of water quality becomes compromised resulting in the use of water with very high bacterial, viral and other coliform organisms' content.

RECOMMENDATIONS

Institutional linkages between the various water sector key players should be improved and enforced.

Future irrigation on projects being planned should consider all sanitary requirements of a irrigation project like proper drainage and clean conveyance systems.

Large irrigation system designs and development should bring about ecologically sustainable environment. This could partly be achieved by recipient community education and mobilization.

It is necessary to incorporate public education campaigns in developed and planned irrigation schemes.

The planners and designers of irrigation projects should take into account associated disease risk aspects brought about irrigation.

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THE ZAMBIAN NATIONAL ENVIRONMENTAL ACTION PLAN (NEAP) AND THE ENVIRONMENTAL SUPPORT PROGRAMME (ESP) ¹

J.M. KASONDE ²

INTRODUCTION

The Adoption of an International Conservation Strategy in 1980 by the International Union for Conservation of Nature (IUCN) created the main impetus for Zambia to develop and adopt its own National Conservation Strategy (NCS) in 1985. Zambia's National Conservation Strategy was jointly developed by IUCN and Zambia. It was aimed at the integration of natural resources conservation in the social and economic development planning process of the country. In addition, it was a response by Zambia to the World Bank's emerging condition that to qualify for funding from the International Development Agency (IDA), a recipient country should adopt a national strategy for the conservation of natural resources.

Zambia's National Conservation Strategy was developed by two working groups of experts. The first was a Technical Group with representation from 30 sectors. This group provided technical inputs to the NCS. The second group was made up of experts who introduced policy dimensions into the National Conservation Strategy. The National Conservation Strategy was generally successful. However, it was not devoid of limitations.

First, the NCS was developed only by experts. Therefore, there was lack of wider consultation at grassroot levels and this created problems of effective implementation.

Second, the NCS placed the burden of programme implementation on the government. This was an erroneous assumption because the government had little money.

Third, the NCS lacked an investment programme that would translate programme activities into tangible actions and results.

Fourth, the NCS ignored the role of the private sector and local communities in the management of the sustainable environment.

Fifth, the strategy was devoid of critical analysis of environmental concerns. Because experts who formulated it did so superficially by focusing on symptoms without taking into account the root causes of problems which are best understood by local communities who interact directly with the environment.

Lastly, and perhaps even more significant was the fact that the NCS was developed when Zambia was a one-party state characterised by central economic planning which gave no prominence to the private sector. With the present multi-party political systems and a market economy where the role of the private sector in economic management is preponderant, it has become necessary to improve upon the NCS by developing the National Environmental Action Plan.

How is the National Environmental Action Plan (NEAP) an improvement on Zambia's National Conservation Strategy?

There is an NEAP Secretariat which is working closely with the Ministry of Environment and Natural Resources (MENR) in implementing the country's environmental and natural resources programmes. Although NEAP is co-funded by donors and the Zambian Government, the former's contribution is greater. Unlike the NCS which places the entire burden of funding on the government, NEAP, therefore constitutes a departure in the right direction. Furthermore, it needs to be emphasised that while working with the MENR in

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programme coordination and implementation, NEAP is also supported by a Technical Committee of 30 members. This facilitates wider consultation. In addition, the ESP1 of NEAP will be implemented using projects to be developed by task forces together with local communities.

The process that led to NEAP involved regional workshops held throughout Zambia. The deliberations from these workshops constitute the major environmental concerns which appear in the "Yellow Book Document" called the Regional Environmental Action Plan (REAP). The main ideas in the REAP, many of which are descriptive, were articulated by a group of experts into the National Environment Action Plan (NEAP) which is a policy document adopted by Government of Zambia in December 1994. Logically, NEAP has alongside it an Environmental Support Programme (ESP1) through which task forces will work to develop investment proposals using community participation approaches.

PROJECT COMPONENTS

The following list of components were identified from the NEAP document as areas that needed to be addressed by the Environmental Support Programme.

Institutional development

1. Institutional Capacity Building in Government Ministries and Parastatals and Non-governmental Organisations.
2. Environmental Education and Public Awareness.
3. Environmental Education in Schools.
4. Establishment of an Environmental Information System
5. Establishment of an Environmental Institute.
6. Establishment of a Regional Environmental Investment Fund.

Environmental research

7. Study on the Rehabilitation and Management of the Wildlife Estate in Zambia.
8. Study Air Pollution
9. Study to Institutionalise Natural Resources Accounting.
10. Study on the Impact of Small Scale Mining on the Environment.
11. Study for the Development and Management of the Kafue River Basin.
12. Study of Bio-diversity.
13. Study of the Impact Economic Policies on the Environment.
14. Study on the Aquatic Environment of Fisheries.
15. Study to Institutionalise Environmental Impact Monitoring and Assessment.

Pilot projects in environmental management

16. Solid Waste Management

17. Rehabilitation of Sewerage
18. Disposal of Toxic Chemicals and Residues
19. Community Based Rural Water Supply and Sanitation.
20. Community Based Environmental Management Project.

Following the World Bank Mission input, the need to phase components was identified as NEAP had no capacity to supervise all the twenty projects. The programmes of such size would also suffer from a lack of participation by implementing agencies. In phasing, priority was to be given to:

- ❖ Components that can be prepared in timely manner.
- ❖ Components whose outputs might facilitate, improve or strengthen the preparation of later ESP components.

Furthermore, the studies needed to lead to revenue generating projects and should be easily and inexpensively executed. As a consequence of this, the list of components chosen for the ESP1 include the following components:

1. Institutional Development to include Capacity Building, Legislation, Environmental Education and Public Awareness, and Establishment of Environmental Information System.
2. Pilot Projects in Environmental Management in all Provinces.
3. Environmental Research on Fisheries, Wildlife and Development and Management of Kafue Basin.

The task forces drawn from various organisations have started work on the above components.

CONCLUSION

NEAP views the current workshop as important and complimentary to the NEAP preparatory process. NEAP therefore commends the organisers for coming up with this workshop on water which is one of its major environmental concerns; others include deforestation, soil degradation, depletion of natural resources (wildlife, fish etc), pollution (water, air etc), the recurrence of droughts and the threats of climate change.

THE HEALTH IMPACT ASSESSMENT OF THE BULEYA MALIMA IRRIGATION SCHEME: PROCEDURES RESULTS AND CONSTRAINTS

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WHAT IS A HEALTH IMPACT ASSESSMENT ?

A Health Impact Assessment (HIA) is done to describe both the positive and negative effects on health of a natural resources development project. It is often a part of the perhaps better known Environmental Impact Assessment. Sometimes Health Opportunity Assessment is used, a slightly better term because it indicates the strive for optimalization of the health situation of the people involved in the project by using all opportunities it presents. Normally an HIA is carried out in the proposal phase of the project. The outcomes of an HIA should be used during the feasibility studies. Collected data can be used:

1. to design health safeguards and mitigating measures to prevent the population from exposure to certain diseases
2. to utilize all the health opportunities as provided by the project to improve the health situation of the community.
3. to make it possible to negotiate the costs and institutional arrangements related to the implementation of health measures.

WHO DOES THE HEALTH IMPACT ASSESSMENT ?

Normally an HIA is carried out on behalf of the implementing agency or ministry. In this case however, the HIA was done in an irrigation scheme to indicate the possibilities and constraints of HIAs in Zambia and for reasons of national capacity building. The team which did this study in Zambia consisted of a member of the Ministry of Health, a member of the Ministry of Agriculture, Food and Fisheries (Irrigation Department), a member of the Ministry of Environment and Natural Resources, a member of the Ministry of Energy and Water Development and a student from the Agricultural University in the Netherlands. The composition of the team, with members with different backgrounds, had the advantage of bringing in a lot of different experiences, resulting in a broad spectrum of interests relating to diseases.

PROCEDURE FOLLOWED

For the HIA the guidelines of Dr. Birley, as described in his workbook *Guidelines for forecasting the vector borne disease implication of water resources development (PEEM 1991)* were used. Three main indicators to describe the influence of a development project on health are used in this publication:

- ❖ environmental receptivity, dealing with transmission patterns of the pathogen, is determined by abundance of the vector/parasite and ecological and climatic factors favouring transmission;
- ❖ community vulnerability to infection depends on the behaviour of the community and their former and future exposure to diseases due to social factors like housing, knowledge and migration patterns
- ❖ vigilance of the health services describes the capability of the health service to deal with new or extended diseases

These three indicators together result in a health hazard. The health hazard indicates if measures are necessary to lower the risk for the population or that the health hazard is so low that it can be neglected. A health hazard

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is normally defined as having a potential for causing harm to people. This potential can increase or decrease due to the development project, and should be described separately for different diseases and different phases of the project.

A work sheet can be filled out for the three indicators for different diseases like malaria, schistosomiasis, diarrhoeal diseases and nutrition. However, the work sheet is developed for use in case of vector-borne diseases, which makes it less applicable to present the effects of the project on diarrhoeal diseases and nutrition.

This work sheet is normally filled out for every phase of the project, like the construction phase and the operational phase. It should be stated here that monitoring plays an important role during the operational phase; unexpected diseases can arise and the health service needs the capacity to deal with these. For the project studied, only minor rehabilitation works are planned, mostly carried out with the help of the local community, so no different work sheets are made for different phases.

The workbook of Dr. Birley contains sections with examples of questions asked to different informants, like health workers in the ministry and in the region of the project, entomologists, agriculturalists, meteorologists, district council managers etc. With the collected data, which give an indication of existing diseases and the potential for new diseases or increase of existing ones, together with the capability to deal with them, a rough indication can be made of the health hazard of different diseases in the region of the project. This information has to be extended with information collected during a field visit, to study the project area on specific local features and community behaviour. Interviews conducted with community members, health workers and irrigation management, as well as literature concerning existing diseases in the area were used as a source of information.

The method of Dr Birley was easily understood by all members of the HIA-team and after reading the workbook a rapid assessment could be made without major problem. The multidisciplinary of the team provided the possibility to study some aspects in greater detail, like an entomologist to search for breeding places of vectors, a drinking water specialist to identify the possibilities and needs for boreholes, an environmental technician to study the use of agrochemicals and the pollution of the environment and so on.

Team members could coach and teach each other, thereby improving the quality of the HIA.

CONCLUSIONS

In conclusion it can be said that each ministry can carry out a simple and fast HIA of their projects, using these guidelines or other available guidelines on rapid health impact assessments. An HIA is a rapid assessment easily made by everybody with some knowledge in water resources development. However, drawing up recommendations for health safeguards or mitigating measures requires some more specialized personnel. The creation of an *ad-hoc* multidisciplinary team greatly facilitates the successful carrying out of an HIA.

Constraints observed during the HIA

The following constraints were observed during the performance of the HIA in the Buleya Malima Irrigation Scheme:

- ❖ lack of (research) data on existing vector species and their behaviour
- ❖ lack of data concerning the project design, like topographic maps, original designs, feasibility studies of rehabilitation works, design of rehabilitation works, costs of the rehabilitation works, data on soils, data on water requirements of the crops
- ❖ due to this lack of data on design, it is difficult for others to enter the design process and change the design in favour of the health of the population
- ❖ it is difficult to get data on existing diseases in the area: only the data of the last three years were available at the district hospital, mostly year figures, not specified for different months. Furthermore, these years were all dry years and thus more or less exceptional

- ❖ the time constraint related to a rapid assessment made it difficult to study social behaviour in detail. Furthermore, the team rushed into the villages and almost directly started to ask questions, without becoming familiar with the local community. However, given the time and money constraints, using a lot of questionnaires in a short time seems to be the most viable method for a rapid HIA.

RESULT OF THE HIA IN THE BULEYA MALIMA IRRIGATION SCHEME

The Buleya Malima Irrigation Scheme (BMIS) is located in the Southern Province of Zambia in Sinazongwe district on the shores of Lake Kariba. It consists of four operational blocks (called phases) of approximately 18 ha each. Phase I and II are directly served by the pump which extracts water from Lake Kariba, water for phase III and IV is pumped during the night in a night storage reservoir and further divided to phase III and IV. Most main canals are lined, except for the main canal of phase IV, and of the secondary canals only those in phase I are lined. Due to water shortages only one block (phase I) is working at the moment. Rehabilitation works are supposed to increase the efficiency of the water use (lining of canals) and to ensure the intake of water from Lake Kariba by replacing the pump site, so that in the near future all phases can be cultivated. Each farmer has a plot of 0.25 ha (called Lima), on which mainly vegetables are grown for marketing. Farmers are organized in a chosen Water Board, which regulates the cropping pattern and the maintenance works. Furthermore, there is a scheme management consisting of a scheme manager and a Japanese volunteer.

Close to the scheme is a rural health centre (RHC) and three boreholes are located in the area. Other activities carried out by the farmers are rainfed agriculture and cattle herding.

The following health related issues were studied by the team, following the described procedure: malaria, schistosomiasis, diarrhoeal diseases, nutrition and agrochemicals

Malaria

General. Malaria is endemic in Southern Province with a clear transmission peak in rainy season. Mean temperatures of more than 20 degrees Celsius make it possible for mosquitos to breed and transmit malaria all year round. However, rainfall restricts mosquito breeding.

The most common parasite species is *Plasmodium falciparum* (97%), the most likely malaria transmitting mosquitos are *Anopheles gambiae* and *A. funestes*. Chloroquine resistance is common in Zambia, in all forms (R1, R2 and R3).

Environmental receptivity. Irrigation is mainly supposed to take place in dry season, to grow vegetables and other labour intensive crops. To raise the profitability of the scheme, the scheme management would like the farmers to grow crops all year round in the scheme, a practice which is not used by now.

The following breeding places can be introduced by the irrigation system:

- ❖ drainage is not done well. Stagnant or slow streaming pools can be formed at the ends of the blocks in which malaria mosquitos can breed. Due to poor knowledge of the farmers it is likely that the agrochemicals spread on the fields reach the drains with excess irrigation water and increase the weed growth in the drainage system, thereby increasing the chance of mosquito breeding.
- ❖ structures in the canals, like drop structures and sand traps, will collect water for some time after irrigation, thereby creating breeding sites
- ❖ more in general: increased humidity will increase the life span of mosquitoes, thereby increasing the risk of malaria transmission
- ❖ the night storage reservoir is not a great risk for mosquito breeding, due to the daily fluctuations in the reservoir
- ❖ the main canal of phase III and IV (partly unlined) can become a breeding place in case of slow flowing water in the canal.

Community vulnerability. The villages of Sikaputa and Syemunimbe are very close to the scheme, within the normal flight range of mosquitos (1.5 km). The population takes no preventive measures against mosquitos, probably due to the lack of knowledge concerning prevention of malaria. Worsening factors are outdoors sleeping and outdoors activities during the evening.

Vigilance of the health services. Although the RHC is equipped with a microscope, the knowledge how to detect malaria parasites in blood is lacking. Confirmation of malaria cases is done by signs like: hot body, chills, fever, vomiting, headache etc. Treatment is solely chloroquine based, although chloroquine resistance is common in Zambia. No other medicines are available at this RHC, in case the patient does not recover he or she is send to the district hospital in Sinazongwe, 17 km. from Buleya. Self treatment, resulting in wrong drug doses and unfinished courses, can be observed as a common practice. It can contribute to an increase the number of chloroquine resistant patients.

No community awareness about malaria or other programmes activities to reduce malaria transmission are in place at the moment, mainly due to the lack of an Environmental Health Technician at the RHC.

Conclusion. Due to extended breeding places, the community behaviour (no protective measures) and the lack of adequate health services the team expects malaria transmission to increase, resulting in two peaks a year, one during the irrigation season, and one in or shortly after rainy season.

Schistosomiasis

General. Schistosomiasis is well known on the shores of Lake Kariba. Both forms of it are common: *S. haematobium* and *S. mansoni*, prevalence of both is high. Both *Biomphalaria pfeifferi* and *Bulinus globosus* are possible schistosomiasis carriers in Lake Kariba.

Environmental receptivity

- ❖ the drainage system can become a breeding site for snails, in case of stagnant or slow flowing water for a prolonged period, say 2 to 3 months, the time for snails to develop and become infective. High temperatures and abundant weed growth in the drainage system will favour breeding of snails
- ❖ the night storage reservoir can become invaded by snails, although this is not very likely, due to fluctuating water levels and steep walls
- ❖ it is unclear if cercariae can still be active after the transport through the pipeline from Lake Kariba to the irrigation system

Community vulnerability. There is a lot of contact of the community with water due to the inadequate number of boreholes and due to the lack of community awareness concerning schistosomiasis. During the field study the team observed people washing their clothes in irrigation structures and taking water from the same and from the reservoir while the domestic waterpump was on the other site of the road. Furthermore, only a few latrines are in use in the villages.

Herd boys are a reservoir of the disease, due to their frequent contact with snail infested water of Lake Kariba during bathing and washing clothes. A study in Chiabi, 30 km from Buleya, showed a prevalence of *S. Haematobium* of 75% in school going boys.

Vigilance of the health services. No information is available to confirm *S. Mansoni*. *S. Haematobium* is slightly easier to detect by counting the number of eggs in the urine of the patient, which can be done without sophisticated equipment. Due to the fact that there are no drugs available for treatment, the community does not go to the RHC in case of expected schistosomiasis. Furthermore, no preventive measures are provided by the RHC, like the support of building pit latrines, education, providing of safe drinking water etc.

Conclusion. Due to the fact that people do not attend the RHC in case of expected schistosomiasis at the moment the schistosomiasis figures for Buleya are very low. However, different studies on the shores of Lake Kariba showed high prevalence of schistosomiasis among people with frequent water contact. Schistosomiasis is not likely to be influenced by the project, however, the night storage reservoir and drainage system can become invaded by snails, and in that case community behaviour and lack of treatment can cause high prevalence in the population.

Water washed diseases

General. Diarrhoeal diseases are a common cause of death in children in Zambia, mainly caused by a lack of safe water. However, education also plays a major role in the spread of diarrhoeal diseases: even if there is safe water one has to store it in a safe place. In addition, diseases related to a lack of hygiene such as scabies and skin infections are common in the area

With running water in the canals this water is likely to be used for bathing and washing and even for drinking by the people who suffer from the lack of safe drinking water. However, by now, most of them get their drinking water also from unsafe sources like shallow wells and lake water.

In case of the irrigation system running, more water is available at household level due to shorter walking distances to a water source and abundance of water in a normally dry part of the year. This abundance of water can improve the hygiene situation and can decrease the number of cases of for example scabies.

Due to the fact that the community has little knowledge in the field of water-washed diseases, even a borehole programme to supply safe water to the community will not necessarily result in a lowering of these diseases; they can, for example, be transmitted due to poor storage facilities or wrong, disease promoting behaviour.

Nutritional status

In Zambia stunting and wasting are common features in children. A weak nutritional status can have an influence on the resistance of a child (and adult) to diseases. Due to weakness, more patients will die of common diseases like malaria, measles and diarrhoeal diseases.

The BMIS will improve the nutritional situation of the population, by providing them with food and vegetables throughout the year. However, it is uncertain if the whole household will profit from increased availability of food, or that the vegetables will be sold on the market and the cash used for the purchase of less nutritional products. No nutritional programme is in place at the moment to teach people how to prepare and arrange healthy meals, with enough proteins, vitamins and so on.

Agrochemicals

Chemicals are used to spray the fields against certain pests. It is done by children who wear no protective clothes. However, it is not known by the team which chemicals are used and what their toxicity is. Chemicals used in agriculture can become a problem when interfering with a malaria control programme if this has a spraying component. Chemicals can poison people when taking sprayed food which has not been cleaned.

Fertilizers are widely used in the scheme. They can be flushed out and reach for example the drainage system, thereby increasing the amounts of weed and vegetation in the drainage system. Due to this increased vegetation, the drainage system becomes a more favourable breeding place for both mosquitos and snails.

Mitigating measures

Following the principle of the polluter pays, most measures are on account of the Ministry of Agriculture, Food and Fisheries (MAFF), together with the beneficiaries of the project, the farmers.

- ❖ for the construction of the new pump site: measures to prevent workers' schistosomiasis by shifting to early working hours, when less cercariae are in the water, by screening the work force regularly, by providing them with appropriate drinking water and sanitation facilities. Costs for the contractor, ie MAFF
- ❖ a study could be conducted to find a snail free pumping site to protect maintenance workers of exposure to infective water.
- ❖ the drilling of boreholes in the villages without safe water supply, combined with a extension campaign on how to store and use safe water. Cost about US\$5500 for one borehole, inclusive hand pump, on account of one of the ministries involved in drinking water supply. Extension can be done by the RHC.

- ❖ free draining structures in the whole scheme. Examples of these structures can be found in Zimbabwe, where they work well. Free draining structures do not collect water after an irrigation event, so the structures are not turned into breeding places for neither mosquitos nor snails. Permanent lining of these structures can be applied at no extra costs, in the other sections the cost will be limited due to the use of labour of irrigating farmers, so only the concrete cost remain. Costs on account of the MAFF in cooperation with the farmers.
- ❖ lining of the main canal of phase IV. This increases the flow velocities, making the canal less appropriate for breeding of either snails and mosquitos. It also reduces weed growth and makes maintenance easier. Lining makes irrigation more efficient (less seepage). Costs for the MAFF, in cooperation with the farmers.
- ❖ improvement of the drainage system: a topographical study should be carried out to indicate the best way of drainage. Drainage ditches can be constructed by the farmers. Cost for the MAFF, construction of the drainage system in cooperation with the farmers.
- ❖ improvement of the overall irrigation efficiency through an intensive extension programme for the farmers. Cost for the MAFF.
- ❖ improvement of health facilities, at the expense of the Ministry of Health, consisting of the following:
 - employment of a Environmental Health Technician (EHT) to look after preventive health measures and work and carry out extension strategies
 - training of the health workers, to teach them the skills of diagnosing and confirmation of malaria and schistosomiasis. Attention to uncomplicated methods like reagent strips for *S. Haematobium* is advisable
 - provision of medicines to treat schistosomiasis, especially in case of the work force at the new pump site

RECOMMENDATIONS

The HIA-team recommends ongoing research in Zambia on this subject. HIA's should be carried out in different schemes with different conditions, to look which is the impact on health of irrigation for the specific Zambian situation. This research can result in guidelines and policy concerning health and water development projects in Zambia. Research data should be made easily available to all ministries involved in water resources development.

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The text of the first chapters (concerning the procedure of the HIA) is merely based on the Guidelines of Dr. Birley. The rest of the text consist of field work and related literature. An extensive literature list concerning schistosomiasis, malaria, diarrhoeal diseases, nutritional aspects and chemical aspects, with special attention to Zambia, is available from the author, Mr. Dijkstra, Department of Human Epidemiology and Public Health, Wageningen Agricultural University, the Netherlands.

Insert figures here

TOWARDS HEALTHY DEVELOPMENT: A TASK FOR ALL OF US

D.S. Dijkstra
Wageningen Agricultural University

I fully realize that health is not the only thing, but that everything else, without health, is nothing, and I think that it is very important to realize this when we look at development at large. Whenever the health component is forgotten, you forget at the same time the vital factor in development, namely the human being, his creative energy, his physical energy.

Dr. H. Mahler, former Director-General of the WHO, in: Tiffen 1991.

INTRODUCTION: WATER RESOURCES DEVELOPMENT PROJECTS AND HEALTH

The literature on the negative impacts of water resource development projects is vast. Well known examples are the increased prevalence of schistosomiasis after creation of man-made lakes, increased malaria transmission due to extended breeding sites in irrigation schemes, spillways of dams forming breeding sites for black flies and many other water related health problems are documented.

In general, uncoordinated development planning, in which health implications are not considered, result in inadequate funding of the health component of the project. This can lead to the above mentioned health problems. However, well designed schemes and programmes to deal with certain diseases can reduce the negative impact of water development projects significantly.

The decision whether a project is feasible or not is often a political one: food security for the urban populations is more important than the health of rural people, and it is sometimes even believed that economic progress is paid for by worsened health circumstances. More attention for health in the project cycle is therefore badly needed.

HEALTH IN THE PROJECT CYCLE

Why attention for health in the project cycle?

"a development path that combines growth with reduced vulnerability (of the community to disease) is more sustainable than one that does not". Birley 1995 Health development is an essential prerequisite for sustainable socio-economic development, as is stressed in the reports *Our planet, our health* (WHO 1992) and *Agenda 21* (UN 1992). A sustainable use of resources will be of paramount importance of achieving the goals of these reports, a healthy environment for all. Uncontrolled development has an accelerating effect on the degradation of the environment, which in turn puts high pressure on the health of the present and future generations. Therefore, the health impact of projects should be known before the project is started, so that mitigating measures can be taken to protect the health of the involved population.

When to include health in the project cycle

"although it is useful analytically to think of the elements, in terms of policy one has to look at the 'package'... there is one time, and I think only one, at which you can really influence the environmental issues. This opportunity lies with the person who writes the Terms of Reference.... At this point, one can influence the priority that will be attached to health and of environmental issues, and if they are not included at that stage, there is almost no chance of them being put in later on". Bradley 1993

During pre-feasibility studies the Terms of Reference (TOR) are followed to the letter, leaving out everything not mentioned in the TOR. Already in the TOR attention for the health component is necessary. Including health in the TOR gives opportunities to do a Health Impact Assessment, to describe the impact of

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the project on health, to adjust the design in favour of health protecting the community from exposure to certain diseases and to discuss the costs of this protecting measures.

The project cycle

According to the project cycle the following steps can be identified:

- ❖ in the proposal phase health is included in the TOR, either by law or by common standards. This should be done by the responsible officer or team, normally from the project implementing ministry.
- ❖ in the identification phase, a first rapid assessment of the existing and forecasted (vector-borne) diseases is conducted. Recommendation are drafted for
 - further in-depth studies on particular health issues
 - design of mitigating measures to reduce the health risks (including health services)
 - the needed monitoring system

During this phase, a intersectoral collaboration body is formed, consisting of members of the leading ministry, other ministries and local authorities from different backgrounds.

- ❖ in the preparation phase this in-depth studies are conducted, necessary inputs in the health system identified and listed and measures to lessen the risk of vector-borne diseases are studied, as well as the cost for caring and curing of forecasted diseases.
- ❖ in the appraisal phase the results of the health studies play a major role during negotiations: funds for health services and (environmental) measures to lower the health risk are allocated and institutional arrangements for the further phases are agreed upon.
- ❖ in the construction and implementation phase the results of the former stages become visible: a monitoring unit is in place to check the health of migrants and residents and management of the project is in place.
- ❖ in the evaluation phase the project is for the first time evaluated. Necessary adjustments in operation and maintenance are agreed upon by the intersectoral body, formed in the identification phase but still in place.

Of course, this is an ideal situation. It may be necessary to change institutions and regulations to include health in an early stage of the project, and to deal with the monitoring and adjustment of programmes after implementation.

The cost of health in a water development project

One of the reasons to include health early in the project cycle are the costs of health measures: when mitigating measures are not included in the project design, the cost for curing the community involved in the project become the full responsibility of the MOH, which itself is generally speaking understaffed and underfinanced in developing countries (Hunter et al 1993). When health is neglected in the design, those who create the problem do not share its real costs, whereas, in justice, those who enjoy the scheme's wider benefits should assist those suffering from it; better still, they should prevent the problems from arising in the first place.

Economic cost of health consist of treatment of patients and loss of work force due to morbidity or even mortality. Treatment costs are quite easily determined, whereas the economic costs of loss of work force are more difficult to determine, due to local economic situations like hidden under-employment and socio-economic constraints. However, the following gives an indication of the seriousness of the loss of work force due to illness in irrigation projects (Hunter *et al.* 1993): for schistosomiasis the following was found: in the Philippines 26-42 working days lost a year; in Ghana 4.4 working days lost a year; in Madagascar, 50% of the

people reported as unable to work had schistosomiasis; exercise capacity of children infected with schistosomiasis was found to be 12% lower than uninfected children (Zimbabwe); severe cases can even lead to permanent disability. For malaria it was found that every episode of *Plasmodium falciparum* costs at least seven days of work loss (Ghana).

Who should pay for these costs

In projects with a lot of health problems the operation and maintenance of the system are not done optimally, due to the loss of work force and bad attitude of the farmers to the scheme. Maintenance is done less regular and less thorough while yields are decreasing due to illness during important farming activities like weeding and harvesting.

To create more sustainable projects health costs should be considered during calculations of the Internal Rate of Return (IRR). An (irrigation) project is normally economical spoken not sustainable with an IRR of less than 10%. If the IRR is only slightly bigger as 10%, no or only little money is available for health measures. Therefore, a IRR of at least 15% is necessary to create a project which can bear the costs of its own health impact (Oomen *et al.* 1990). When the IRR is high, the beneficiaries can contribute in the recurrent costs of preventive health measures to protect their health.

Measures to prevent local communities from disease are normally consist of good irrigation practices and improvement of the general status of welfare of the community, for example:

- ❖ lining and maintenance of the canals
- ❖ levelling of fields
- ❖ using more sophisticated irrigation systems, like sprinkler irrigation
- ❖ good drainage system
- ❖ drinking water supply and sanitation
- ❖ screening of houses
- ❖ health education
- ❖ filling of construction pits

The first measures consist of sound irrigation practices, and the costs of these health safeguards or mitigating measures should at least partly be paid for by the irrigation authority. They improve the irrigation efficiency and therefore pay themselves back due to lower operation and maintenance costs.

"where farmers do make a direct payment to the scheme authority their willingness to pay for good maintenance may depend on their knowledge of the linkage between health and water. Health education can help increase willingness to pay" Tiffen 1991. This quotation stresses the need for integrated packages to protect and improve the health status of farmers, consisting of both good management and education.

HOW TO REACH THIS ATTENTION FOR HEALTH ISSUES ?

Several options are available and described in the literature to strengthen the position of health in the project cycle:

- ❖ Strengthening of the position of the MOH in water resources development

Data should be made available concerning existing diseases in the country, for use during feasibility studies of projects, and to show the importance of certain diseases.

The MOH should play a major, leadership role in the intersectoral collaboration which is needed for healthy development. Therefore, the ministry itself should have a strong internal infrastructure.

This strong infrastructure will also help to turn Memoranda of Agreement into action, in stead of hiding them in desks.

The MOH can strengthen its position during negotiations by having a sound and clear short and long-term vision on vector-borne diseases.

Traditionally, in most countries, the MOH is a curing agency. However, early attention for health in the project cycle is rather preventive (caring). The MOH should, if necessary, strengthen their attention for preventive health, for example by starting up programmes in the field of environmental health.

- ❖ Introduction of legislation concerning environmental and health impact assessments.

Environmental Impact Assessments should include a health component in stead of looking solely after environmental matters.

An Act on the need for EIA's with a health component or for EIA's and separate HIA's is a prior necessity and should be made by the government.

There is a need for a strong Ministry of Environment to attend other ministries on the need and possibilities of EIAs and to develop guidelines to be followed during the project cycle.

- ❖ Creation of awareness in all bodies and ministries concerned with water resources development of the need for health in their projects

A national intersectoral body concerning water resource development should screen all the projects and develop guidelines for implementation of projects, including health and environmental issues.

Seminars and workshops concerning water resource development and health.

Capacity building in the field of EIAs and HIAs.

RECOMMENDATIONS SPECIFIC TO THE ZAMBIAN SITUATION

National Environmental Action Programme (NEAP)

The NEAP is a document concerning the policies of the Ministry of Environment and Natural Resources for the next years. The following principles guided the writers of the NEAP:

1. The right of citizens to a clean and healthy environment
2. Local community and private sector participation in natural resources management
3. Obligatory Environmental Impact Assessments of major development projects in all sectors.

The main thrust of the NEAP is to identify environmental problems and issues, analyse their causes and recommend action required to solve those issues. Keys to reach this are institutional arrangements and legal reforms as well as capacity building and education.

EIAs are only required for large scale projects. However, much small scale projects cause large environmental problems for the involved communities. At least guidelines for environmentally sound development of small scale projects should be developed.

A missing point in the NEAP is the lack of attention for environmental health or diseases. A major opportunity for introduction of health in the project cycle is missed by leaving health out of the EIAs. Preferably, attention for health should be one of the main items of an EIA.

Water Act

The use of surface water is regulated by the Water Act. Use of surface water is restricted to domestic water use, for other purposes water rights are needed which can be obtained from the Water Board. Ground water however is free of use. No protection against abuse of ground water is in place at the moment. Large scale farmers can lower the ground water level by using it for their irrigated fields. Due to this lower ground water level, communities can no longer use their shallow wells or boreholes. This is a threat for the health situation of the household, because a substantially amount of safe water available at the household level is one of the

cornerstones of a healthy environment. District water bodies should be set up, with members of various ministries including health, environment, water affairs, local government and other ministries involved in water projects, to divide the scarce water rights and take care of the interests of the whole society. Unfortunately the National Water Masters Plan identified ground water as an almost inexhaustible source of water for use for both domestic and agricultural use, thereby neglecting possible the negative impacts related to the use of ground water. In future documents concerning national policies, the MOH should try to influence the policy in such a way that the health impact of the policy is taken into account.

The Ministry of Health

A strong MOH is a key element in implementing health in the project cycle. The following subjects are of importance:

1. Research on vector-borne and other diseases to guide the districts and policy makers

- ❖ By now, programmes to control malaria and schistosomiasis are left to the districts. However, the districts lack the equipment and manpower to carry out research on how to combat certain diseases. A national research centre should provide the districts with guidelines how to deal with certain diseases. The districts in turn can decide whether it is necessary in their district to carry out a control programme or not, based on the epidemiological data of their district.
- ❖ The data collected by the national research can be used in the assessment of the health impact of bigger and smaller water resource development projects. A lack of data on diseases normally results in ignorance of these diseases during negotiations in the appraisal phase of the project cycle.
- ❖ Research data must be used in policy making. Therefore, the data collected should be made easily available to policy makers within the MOH, who can use this data together with epidemiological data to develop policy.

2. Transformation from a curing to a preventive body

- ❖ Decentralisation of the internal HQ structure. During the Health Reform programme, districts have become more autonomous and are given more power to define their own policies. The HQs themselves, however, are still working following the old system. Within the HQs a review of tasks (policy makers should make policy and administrators do the administration) and decentralisation of power (more power to lower personnel) should lead to more attention for preventive health. By now, policy makers are too much involved in administrative business thereby neglecting their policy making tasks. Time constraints in general lead to a reactive attitude, there is only time to deal with occurring epidemics, and no preventive programmes are developed.
- ❖ At district level there is a lack of means (equipment and knowledge) to carry out research. This makes preventive health programmes less effective due to the fact that the best solution is not always known.
- ❖ Strengthening of the role of extension at district level, guided by national guidelines of the MOH and in coordination with extension activities of other ministries. Preventive health measures will only work when the community support it with their behaviour.

Intersectoral Collaboration Body

By now, a large intersectoral body is organized for writing and discussing the National Water Masters Plan. This is a unique opportunity to transform this body in a permanent one looking after all water related issues and drawing up continuously advisory policies how to develop water resources. The MOH and MENR should be the 'watchdogs' of environment and health in this agency.

The MOH and MENR are already involved in the National Water Masters Plan. However, due to their weak internal structure their influence is not measurable. To play a major role in future, a strengthening of their position is needed.

Division of activities over different ministries

At the moment, some activities like drinking water supply and sanitation are carried out by different ministries and a lot of NGO's. Due to this diversion it is not clear which ministry or agency to involve in the negotiations concerning a development project when including a drinking water and sanitation part. A intersectoral body should be formed to coordinate action in this field and to be contacted in case of drinking water and sanitation projects. Extension on health issues concerns often a lot of disciplines: it includes education about hygiene, nutrition, agricultural practices and social behaviour. Mainly responsible for this extension is the MOH. They should carry out their extension work in close collaboration with extension workers of different ministries, to combine their packages to a single, multi-target package.

Financial lines

In the Health Reforms power is given to the districts to spend their budget in a way they want, taken into account certain package ceilings. This kind of budgeting empowers the district level and challenges districts to make their own policies and to bring health as close to the community as possible. This empowerment leads to dedication to their work and creates opportunities for community participation. Powerful districts are more likely to hear about water resource development projects in their region and are more likely to influence these development projects, to turn them into healthy projects. Decentralisation is the only way to create strong districts, and should be studied and implemented by all ministries. A good example is given by the MOH, who dared to implement this decentralisation rigorous and complete.

Project management board

For every project a agency should be formed consisting of the leading ministry (the one who implements the project) and representatives of different district organizations, like the District Health Board, the District Council and so on. The local authorities have to be involved early in the project cycle so that they can influence the design of the project by their local knowledge and adjust their policies and budgets due to changed circumstances induced by the project. This prevent district authorities of being placed for a unchangeable and unexpected fact. Necessary arrangements therefore are:

- strong district authorities, who can make their own policies (as described in chapter 4.6).
- open design procedures, ie it must be possible to enter the design process for affected district agencies (see 4.8).

After implementation this agency can be turned into a permanent advisory board of the executive authority, to help them dealing with cross-sectoral problems.

Creating open design procedures

At the moment the design procedures of the MAFF are not clear. Designs and feasibility studies are internally handled. Others are left out of the negotiations about design and feasibility of the project. Open design procedures give the opportunity to the empowered districts to enter the project cycle.

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INSTITUTIONAL AND LEGISLATIVE STATE IN WATER RESOURCES MANAGEMENT IN ZAMBIA

Andrew Mondoka¹

INTRODUCTION

This paper gives an outline of the present state of the Water Board, highlights its weaknesses and suggests ways of turning it into a more effective organization. The existing principal legislation on water has been revised to accommodate current needs of society and it has also been drafted in such a manner as to make it more comprehensive and accurate to avoid loose interpretation. The fundamental changes are outlined and reasons for their inclusion have been explained. In short, the paper also explores means and ways of improving and harmonizing the management and development of water resources of Zambia.

WATER DEVELOPMENT BOARD

The Water Act, Cap. 312 of the Laws of Zambia, was enacted "to consolidate and amend the Law in respect of the ownership, control and use of water in Zambia", which entails that the ownership of all water is vested in the State. The Water Development Board was established to administer the provisions of the Act by issuing licences in the form of Water Rights and hence control the use and abstraction of all surface water in Zambia. The regulation of groundwater resources is at present non-existent. The Act in addition does not extend to controlling international river courses such as the whole Zambezi, and portions that constitute international borders on the Luapula and Luangwa rivers.

The Water Board is appointed by the Minister responsible for water resources. In its infancy the Board was placed directly under the Ministry headquarters but due to the nature of its statutory functions it was at the time felt that it should be placed under the Department of Water Affairs which is the situation at present.

Composition of Water Board

Shortly after independence, the Water Board comprised a chairman, who was an independent person from the private sector, the deputy chairman was the Director of Agriculture, other members were the Commissioner of Lands, Head of Land Use Services (Agriculture), Director of Water Affairs and two individuals who served as Panel members.

At present the Water Board comprises a chairman, two representatives from the Zambia National Farmers Union, Directors of Water Affairs, Energy, Agriculture, Resettlement, Environmental Council for Zambia, Commissioner of Lands, Chief Health Inspector and the Assistant Director of Agriculture. These are all principal members of the Board. There is in addition a provision for the appointment of Panel members with specific qualities that will help the Board in arriving at decisions on certain specific applications.

This composition illustrates that the Board has legitimate representation because it covers a wide range of stakeholders. The majority of Board members are senior civil servants, this means that the decisions taken have the backing of the appropriate wings of Government.

The Board convenes to: consider applications at Public or Private Inquiries, tour areas to see how applicants actually use the water rights that are issued to them, solve disputes between applicants and users of water as and when they arise, discuss any matters associated with Water Rights and general use of water in Zambia and discuss the administration of the Water Board.

Objective of the Board

Specifically, the objective of the Board is to promote an integrated water resources management in Zambia. This notion is based on the perception that water is an integral part of the ecosystem and is socially and economically good and whose quantity and quality determine the nature of its utilization. To this end, all

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water resources must be regulated, in order to satisfy all activities, from agricultural use of water, land, industrial production, recreational activities, in towns and cities, because they all have an effect on social and economic systems. It therefore becomes necessary to put into place an appropriate institutional and legal structure that will ensure that:

- ❖ water in streams is sustained by ensuring that abstractions are regulated so as not to reduce or deplete completely the flow of water in rivers and streams
- ❖ land husbandry is properly managed, especially in higher catchment areas so that the risk of flooding or silting of hydraulic structures downstream is reduced and poses no danger to life and property
- ❖ in the field of large scale irrigation, the return flows of water back into the streams which often carry numerous dissolved fertilizers which pollute the streams and affect their ecological balance are minimized.

Administration of the Water Board

The day to day running of the Water Board is carried out by the Secretariat and the Inspectorate Team. The Board will only convene when the Secretariat and Inspectorate have completed their prescribed duties. Consideration of a Water Right is dependent on the availability of data and other prescribed documentation.

- ❖ The Secretary is bound by statute to send a copy of each application to the Water Officer, for him to send engineers to investigate a particular application in a given area and report his findings to the Secretary who when satisfied that the application is complete presents to the full Board for consideration.
- ❖ The Secretariat comprises the secretary, an assistant clerical officer, water development assistant, a classified daily employee and two typists.
- ❖ The inspectorate team is headed by the Water Officer, assisted by an engineering assistant. These officers are seconded to the Board.

Problems associated with the present system

The Inspectorate team and Secretariat are unable to effectively carry out their duties because they have not been provided with appropriate resources. The Water Board receives all its resources from the department of water affairs. This means it is dependent on the Director of Water Affairs for its operations.

- ❖ Transport: the two vehicles that are used by the Board were provided in 1991 and 1992 and have been used for all inspections/investigations by the inspectorate team, day to day administration and meetings of the Board to consider applications in different parts of the country. The vehicles are currently in a deplorable condition and in need of constant repair. Efforts to obtain new vehicles have been in vain.
- ❖ Finances: the finances of the Water Board are grossly insufficient compared to its requirements. The Secretariat presents the detailed requirements of the inspectorate and the day to day operations of the Water Board to the Accounts section of the Ministry of Energy and Water Development often resulting in insufficient funds to meet the requirements. Below is the situation of estimates made and consequent releases:

	Estimated	Approved
1993	K 29 000 000	K 7 000 000
1994	K300 000 000	K15 000 000
1995	K224 000 000	K15 000 000

Revision of the water legislation

The Zambian Water Law is in the process of revision because it no longer represents the needs and aspirations of current society. The Water Board functioned under a background where very few applications were received from all sectors of the economy, the field of irrigation was less developed, and the hydrological season was favourable and the nation's general industrial state was not so developed hence the demand on water resources was minimal.

At present we find ourselves in a situation where the nation has developed and has deliberately moved away from relying on copper as the mainstay of the economy and is now emphasizing the agricultural sectors as an important area of economic growth.

The Water Act has been revised to accommodate a wide range of issues such as the regulation of ground water resources and many of the areas ignored have been comprehensively explained to avoid past ambiguities. This means that the Water Board has now redefined its objectives and to implement them it will be necessary to improve it as a body, by strengthening its capacity so that it can carry out its statutory functions.

Abstraction of ground water

At present one finds that groundwater development has reached an alarming rate, where the quantity and quality of the resources are being depleted at such a drastic rate that a check has to be made to regulate its abstraction. The Lusaka district is one such area.

Siting and drilling of boreholes. Before the siting of any borehole or well, the Board will investigate the suitability of the site

Minimum distance between boreholes. The Board will establish minimum distances for the siting of boreholes and wells to avoid the interference between holders of groundwater right holders to avoid serious conflicts when one withdraws more than the other.

Quality of groundwater. The quality of groundwater in boreholes and wells will need to be tested to ascertain its quality before use. This will have to be carried out with other bodies especially the environmental council of Zambia.

Sealing of defective boreholes. There are numerous boreholes that have encountered salt water or have been contaminated. The Board shall ensure that they are effectively sealed and cased by the owner to attempt to confine the contaminated water to the strata to avoid contamination of other strata or surface water. The Board shall establish certain conditions regarding defective boreholes.

Striking an aquifer. Any person or institution striking an aquifer while mining shall notify the Board of the findings and the Board shall consider the application.

Registration of borehole constructors. There are numerous companies that engage in the actual drilling of boreholes. It is important that the Board establishes standards to be enforced.

Record of works to be maintained by the Board. Confidential records shall be kept by the Board to ascertain that work is being executed properly.

Groundwater rights (quantity of water). Water rights for groundwater will be granted on the basis of the relative quantity of water reasonable at the time of granting.

Review of water rights. As the hydrological situation changes it may be necessary to review water rights, so that minimum abstractions are maintained and groundwater resources are not depleted.

Maintenance of borehole and well register. A register of all boreholes/wells in the country will be kept by the Water Board. A national data bank of both surface and ground water will be kept by the Board- This will help in the overall water resources management of Zambia.

Comprehensive rules and regulations on water rights

There is at present ambiguous legislation in terms of certain regulations and actual rules. This has made the work of the Board rather difficult because in some case it has to rely on assumed interpretation of the Water Act. The proposed amendments have clarified numerous points that were unclear.

Division of occupancy. When a property is sold or subdivided and it held water rights, it will now be easier to acquire new water rights because the proposed Act has made it clear and straight forward. The proposal

has a provision for the Water Rights to be surrendered to the Board who in term draft of issue a new water right on terms and conditions agreeable to all parties concerned.

Apportionment of water. Water rights will now be apportioned for specific pieces of land if so required by the holder of the Water Right. Any holder may apply to the Board to have the Water Right amended and split divided into two or more parts of his/her land. The original total amount of water will not be altered as such, nor will the rights of others be affected by this variation.

Change of use of water and change of point of abstraction . The use to which a water right is granted can at present be changed at will by an applicant. This has proved that applicants use or retain more water than required. It has in certain instances caused conflicts among water right holders. The proposal requires that anyone wishing to change the use and point of abstraction should apply to the Board for a formal change of both the use and point of abstraction.

Wasting of water. The present Act is not very clear on the issue of wasting water resources. The Board has been at pains to attempt to ensure that users are more efficient in their use of water. However, because no direct reference exists in the Act, it has been very difficult to enforce. The proposal states clearly that holders should abstract only the amount of water required, or cause water to run to waste.

Works to be kept safe. Hydraulic works such as dams and weirs at present have very loose legislation to regulate them. There is a proposal to ensure that the operation and maintenance of all works are kept at all times in a safe manner so that they do not pose a danger to life or health.

Water not to be released without prior notice. The Board has received complaints from certain users of water that operators of dams do not alert them before they release water. The proposal will require all operators of structures to give reasonable notice to all operators of structures to give reasonable notice to all persons/ institutions whose property may be damaged in any way or affected by such release of water from the structure.

Failure of structure. When a structure such as a dam breaks or collapses it is to have failed. It will be the responsibility of the operator to inform the local authority office of any impending damage. This action will, however, not make him/her liable for any claims as a result of loss or damage to property, or injury to persons as result of wilful or accidental release of water.

Penalties increased to act as deterrent. The present penalties are unrealistic and cannot act as deterrents.

Confiscation of pumping units. In addition to the meaningful fines the proposed Act has made provision for the Board to have the power to confiscate actual pumping units to ensure that an offender is completely stopped from abstracting water from a stream or borehole the Board has been faced with difficult situations in cases where a conflict arises and the Board orders a holder or user to cease abstractions but it fails to effectively enforce its order.

General powers of the minister increased to include

Emergency measures during drought or during floods. At present there is no legislation that can be put into place to alleviate suffering, or great loss of life during emergencies such as flood or drought. The current drought has been very difficult to manage because no legislation that cuts across ministries was in place to bring all participants together in an effort to solve a problem of a particular emergency.

Course of action to be taken

- ❖ in the case of drought: the suspension of water rights, establish areas from which water may be abstracted and give necessary and practicable order that will ensure an equitable distribution of water.
- ❖ in the case of floods: instruct authorized officers to dispose of structures and other obstacles, use land, purchase soil, gravel or other materials and any other measures as may be required, to minimize possible danger to life and property.

Establishment of water committees. For any programme involving the public to achieve a degree of success it must be implemented throughout community participation level. It has therefore been found necessary to

form committees that will initially act on an administrative basis for the water board. It is the Board's opinion that such committees will make the Government become more accountable to the public and services demanded by the public will be delivered more efficiently.

Comprehensive regulation and hydraulic structures

The Water Board has realized that the current legislation on hydraulic structures is inadequate. The proposed Act, has laid down comprehensive regulations on the design and construction of all works associated with the impoundment, diversion and abstraction of surface and groundwater.

In the case of dams or weirs many have been constructed improperly and some have had no designs to back them. Some of the structures have stood the test of time. The proposals have stipulated among other things that all persons engaged in the design and construction should be registered by the Board. Standard for the designs for such structures has been clearly put into the Act. This will make it compulsory for all those intending to construct dams and weirs to adhere to statutory standards. One of the most significant provisions is that a low-flow pipe should be put in all dams and weirs to ensure that streams and rivers are not completely blocked. This is intended to sustain the ecological balance in the streams.

RECOMMENDATIONS

The Water Board receives revenue from "fees" on application forms, renewal forms, registration of water rights in the Lands and Deeds Registry of the Ministry of Lands, and "charges" on the quantity of water (abstracted) as issued on Water Rights. The current "charges and fees" are not adequate for the requirements of the Board and there is a need to review the statutory instrument No 20 of 1993.

It is recommended that "fees" received from application forms for new water rights, renewal applications for the use of water for domestic, agricultural, industrial, mechanical, hydroelectrical and other uses of water from both surface and groundwater should remain to accrue as revenue for the central treasury.

The "charges" are only received when an applicant is granted a water right or a renewal of water rights. It is based on the actual quantity of water abstracted by the holder of the water right and is aimed at instilling a better and more efficient use of water by holders of water rights.

It must be realized by all users of water that water has an economic value and users should be willing to pay for it. The Water Board grants rights to the use of water by stating the quantity of the water on the water right. It is envisaged that water will be used more efficiently if users are charged for the quantity of water they actually use, because they will not pay for water they do not require.

It is recommended that Cabinet authority be sought to allow the Board to retain the funds received from "charges" on water rights. The funds would be kept in an account and the Board could have access to them as and when necessary. This retention of funds will help in offsetting the expenses incurred in the purchase of stationery and other items.

The Water Board when considering water rights depend on the technical reports made by its investigating team. This is also dependent on the releases from the central treasury. In the last few years the releases have fallen far short of the expectation. The Board has not been able to hold public inquiry meetings this year to consider and grant water rights owing to the insufficient funds available for the investigating team who have to collect technical data. This therefore means that in the coming year if the Water Board does not receive adequate funding it will be unable to discharge its added responsibility of controlling groundwater resources.

The Water Board has established water management committees in different areas of the country to enable the actual users of water to participate in the administration of their water resources. It can be proposed to these committees that a fund be set up to be used by the Water Board when activities are required to be undertaken in their respective area. This is an alternative which the farmers have expressed willingness to adopt.

INSTITUTIONAL RELATIONSHIPS

There is a present a very weak institutional coordination between all organizations involved in the

development and management of water resources in Zambia. It will be necessary to create a more conducive and closer working relationship among the organizations.

Department of Water Affairs. The Department shall continue to deliver expert advice to the Water Board. However, the Water Board should be made more autonomous especially in the field of finance and should revert to being placed directly under the Minister responsible for water resources. This will give it the required status and confidence it requires to discharge its statutory provisions more efficiently.

Environmental Council of Zambia. All environmental issues are handled by the Environmental Council of Zambia which does not mean that the Board will absolve itself of all issues related to the environment. A close liaison relationship would have to be established. The Board must continue to be heavily involved in the environmental issues as water is prime moulder of the environment.

It is unfortunate that at present there is a conflict of law as the Water Act, being the principal Act, still has the mandate to regulate pollution. This has not in practice caused serious problems as the latter has more capacity to execute such provisions and is well advertized as the the prime body dealing with pollution.

Department of Agriculture. The bulk of applications received by the Water Board are for irrigated agriculture. The Water Board realizes the importance of this sector and this is demonstrated by the fact that there are four members from the sector who sit on the Board. However, the working relationship with the Department is rather weak and must be increased and strengthened.

CONCLUSION

From the above paper it is clear that there is an important role to be played by the Water Board in overall water resources management and development. There is an urgent need to ensure that the Board has the ability to effectively administer its legal obligations. The management of groundwater resources is a novel activity in Zambia and the need to conduct study trips in countries that have wide experience in this activity is of paramount importance. Funding for such trips should be found as soon as possible before legislation is passed. The notion of making the Board more autonomous has to be also explored in earnest if the country's water resources are to be efficiently developed and managed.

ANNEX 1

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ANNEX 2

NATIONAL SEMINAR ON WATER RESOURCES DEVELOPMENT
AND VECTOR-BORNE DISEASES IN ZAMBIA

SEMINAR PROGRAMME

Monday, 6 November 1995

- | | |
|-------|--|
| 15.00 | Participants arrival and Registration at Pamodzi Hotel |
| 16.00 | Refreshments, Participants and other Guests seated |
| 16.30 | Guest of Honour and Entourage arrive |
| 16.40 | Welcoming Remarks - NOC Chairman |
| 16.45 | Introduction Guest of Honour and Other dignitaries - P.S. MOH, Chairman |
| 17.00 | Remarks by WHO Representative |
| 17.10 | Remarks by the FAO Representative |
| 17.20 | Remarks by Honourable Dr. K. Kalumba, MP
Deputy Minister of Health |
| 17.40 | Official Opening by Guest of Honour,
Honourable E. Nawakwi, MP Minister of Energy and Water Development |
| 18.00 | Videos and Discussion |
| 20.00 | Dinner |

Tuesday 7 November 1995

- | | |
|-------|--|
| 07.00 | Participants leave for Kafue Gorge |
| 10.00 | Arrival and check in KGRTC |
| 10.30 | Introduction, objectives and expected outputs - R. Bos |
| 10.45 | Intersectoral collaboration principles - R. Bos |
| 11.00 | Discussion |
| 11.15 | FAO's strategies for Irrigation Development in southern Africa - A. Kandiah, FAO |
| 11.30 | Discussion |

- 11.45 Flow Chart Development, introduction to the task - J. Williams
- 12.30 LUNCHBREAK
- 14.00 Formation of two parallel Working Groups
- Construction of a flowchart of water resources development planning in Zambia
- 15.30 Refreshments
- 17.00 Closure of afternoon working group sessions

Wednesday 8 November 1995

- 08.30 Consolidation of the planning flowchart
- 10.00 Refreshments
- 10.15 Water Resources Policy and Management - P. Chola (MENR)
- 10.30 Discussion
- 10.45 EIA Procedures and Legislation - C. Kashinga (ECZ/MENR)
- 11.00 Discussion
- 11.15 Investment and Planning Procedures Mrs Bwalya, NCDP
- 11.30 Discussion
- 12.00 LUNCHBREAK
- 13.30 Health Policies and structure of the Health Sector - Mr S.T. Chisanga, MOH
- 13.45 Discussion
- 14.00 Agricultural Water Use - Mr D.S. Moono, MAFF
- 14.15 Discussion
- 14.30 National Environmental Action Plan
- 14.45 Discussion
- 15:00 Refreshments
- 15.15 Formation of three Working Groups with the following topics:
- (i) Policy Reform
 - (ii) Institutional Arrangements
 - (iii) Capacity Building
- 18:00 Closure of afternoon working group sessions

Thursday, 9 November 1995

Morning field trip to the Kaleya Smallholder Company - Mazabuka

Lunch at the guest house of the company

Afternoon visit to the Kafue Gorge Hydroelectric Plant

Friday 10 November 1995

- | | |
|-------|---|
| 08.30 | HIA Research Findings - D. Dijkstra |
| 09.00 | Discussion |
| 09.30 | Consolidation of Working Group Reports |
| 10.15 | Refreshments |
| 10.30 | Formulation and adoption of Recommendations |
| 11.15 | Follow-up Action |
| 12.00 | Closure of Workshop |

ANNEX 3

EVALUATION

The seventeen participants were asked to evaluate the seminar. They were asked to freely comment on aspects of the different components of the programme that were positive or needed to be improved. The results of the evaluation are presented below. Areas commented on and the proportion of participants who made the comments are indicated. Also indicated are the proportion of participants who did not comment on the components.

The Programme

<i>Positive:</i>		<i>To be improved:</i>	
topics	35%	time schedule	59%
overall	6%		
inter-sectoral approach	6%		
preparation	6%		
no comments	47%	no comments	41%

Opening session

<i>Positive:</i>		<i>To be improved:</i>	
guests of honour	24%	organizing committee	12%
overall	24%	ministerial attendance	12%
aspects	6%	time schedule	6%
objectives	6%	media attendance	6%
no comments	41%	no comments	65%

Introductory address WHO and FAO

<i>Positive:</i>		<i>To be improved:</i>	
overall	41%	third world relevancy	6%
objectives	18%	clarity	6%
topics	18%		
provocative	12%		
clear text	6%		
no comments	6%	no comments	88%

Planning Task

<i>Positive:</i>		<i>To be improved:</i>	
preparation, coordination	18%	guidelines	24%
overall	12%	timing	18%
laborious	6%		
multi-disciplinary	6%		
explanation/details	6%		
no comments	53%	no comments	59%

National Presentation

<i>Positive:</i>		<i>To be improved:</i>	
overall	18%	time schedule	35%
subjects	18%	time for discussion	6%
presentations	12%	issue relation	6%
debate	6%		
no comments	47%	no comments	53%

HIA presentation

<i>Positive:</i>		<i>To be improved:</i>	
overall	29%	clarity	12%
aspects	18%	checklist	6%
practical	6%	timing	6%
preparation	6%	completeness	6%
no comments	41%	no comments	71%

Field trip

<i>Positive:</i>		<i>To be improved:</i>	
educative	35%	time schedule	24%
objectives	24%		
coordination	12%		
overall	12%		
arrangements	12%		
no comments	6%	no comments	76%

Working Group sessions

<i>Positive:</i>		<i>To be improved:</i>	
overall good	41%	definition/clarity	6%
coordination	12%	method of grouping	6%
discussion	12%		
good timing	12%		
team spirit	6%		
overall	6%		
no comments	12%	no comments	88%

Structure of seminar

<i>Positive:</i>		<i>To be improved:</i>	
well structured	41%	timing (lack)	24%
overall	24%	conventional	6%
no comments	35%	no comments	71%

Facilitation

<i>Positive:</i> overall	65%	<i>To be improved:</i> sector-representation	6%
no comments	35%	no comments	94%

Resource Persons

<i>Positive:</i> overall	41%	<i>To be improved:</i> subject	12%
experienced	18%		
no comments	41%	no comments	88%

Rooms

<i>Positive:</i> overall	65%	<i>To be improved:</i> mosquito nuisance	18%
		sharing of rooms	12%
		overall	6%
		TV/telephone	6%
no comments	35%	no comments	59%

Meals

<i>Positive:</i> overall	94%	<i>To be improved:</i> freshness/variety	24%
no comments	6%	no comments	76%

Seminar facilities

<i>Positive:</i> overall	88%	<i>To be improved:</i>	
no comments	12%	no comments	100%

Materials provided

<i>Positive:</i> overall	88%	<i>To be improved:</i>	
no comments	12%	no comments	100%