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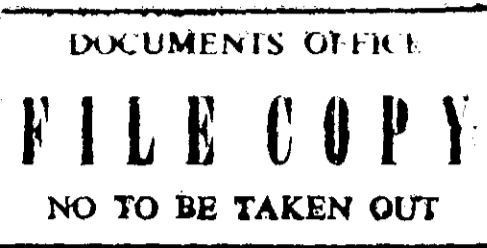
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ECONOMIC COMMISSION FOR AFRICA



REPORT OF THE WORKING GROUP  
OF EXPERTS ON WATER RESOURCES PLANNING  
Addis Ababa, 15-25 June 1970

M70-1460

### Background

The Economic Commission for Africa at its ninth session, in February 1969, included in its programme of work the convening of a working group of experts to examine problems of water resources planning and implementation in the region, and also to prepare a draft outline for a publication to assist the responsible authorities in planning water resources for the social and economic development of their countries.

Accordingly, the ECA secretariat organized such a group in co-operation with the United Nations Office of Technical Co-operation. The meeting was attended by seven member countries of the Commission: Ethiopia, Morocco, Sudan, Tanzania, UAR, Uganda, Zambia, as well as by the President of the Niger River Commission and the Secretary General of the Inter-African Committee for Water Studies. In addition, the United Nations Headquarters, the Food and Agricultural Organization of the United Nations, UNESCO, the World Meteorological Organization, the World Health Organization and the IBRD were represented. The Working Group met at Addis Ababa, from 15 to 25 June 1970. A list of participants is given in annex I.

### Opening session

The Executive Secretary of the ECA, Mr. P. A. Gardiner opened the meeting. In his address, he said that the time had come to define the nature and the problems of water resources development planning and implementation which face the African Governments at present and are likely to become acute during the next ten to twenty years. He stressed the need for adequate inventory of water resources available to the countries. He expressed his belief that the problems of water legislation and administration needed intensified attention by Governments. Water resources development was urgently needed in rural areas in order to improve conditions in those areas as compared with urban centres. Such measures ought to form part of a programme for transforming rural communities. Last but not least, there was the problem of manpower and training and he felt that co-operation by Governments could be of great help in tackling the training problems.

### Election of Chairman

Mr. F.K. Lwegarulila (Tanzania) was elected Chairman of the Working Group.

### Agenda

The agenda adopted by the Working Group is given in annex II. Background papers had been prepared by the Natural Resources and Transport Division of the United Nations, the FAO, WMO, WHO, UNESCO and the IBRD as well as by invited authors. The introduction of each paper was followed by discussion. The list of papers is attached as annex III.

The names of the discussion leaders on the various subjects are listed below :

<u>Subject</u>	<u>Discussion leader</u>
Water Resources Inventory	Mr. Chaoui
The Role of Meteorology and Hydrology in Economic Development	Dr. A.F. Fahmy
Financing of Water Resources Development Prospects	Mr. Hailu Yemanu
International Drainage Basins	Mr. S. Tewu'ngwa
Problems of Irrigation Development	Mr. Saghayroon El Zein
Groundwater in Africa	W. Gagara
Rural Water Supply	Dr. G. Kovacs
Conservation of Water Resources	Mr. G.A.N. Starmans
Water Policy, Administration and Legislation	Mr. E. Lwegarulila
Problems of Manpower and Research	Mr. D.G. Kabega
Water Resources Development and Social Welfare	Mr. G. Kakadie
Preparation of a Publication on Water Resources Planning	Mr. E. Lwegarulila

### Field trips

On the 20 and 21 June, the working group of experts visited a modern large-scale irrigation scheme and three hydro-power plants in the Awash valley. The experts also exchanged views on the development pattern, problems encountered and the water resources planning aspect of the Awash basin.

### Closure of the meeting

In closing the meeting, the Chairman expressed the working group's appreciation of the excellent manner in which the secretariat had organized and serviced the meeting. He felt that the exchange of experience which had taken place during the session had been very useful and he encouraged the participants to keep contact with their colleagues in the water resources field in other African countries. Continuous exchange of information would benefit all concerned. He hoped that it would be possible for ECA to continue to organize meetings on specific topics of water resources development problems.

### Sessions and recommendations

A short report on each of the sessions and the recommendations adopted are given below, in accordance with the topics of the agenda.

### General recommendations

The working group adopted the following general recommendations:

- Because of the urgent need in Africa for the collection, compilation and interpretation of data regarding water resources, assistance should be given to governmental and inter-governmental African agencies in establishing "data banks", and in preparing synthesis documents and analytical bibliographies.
- Improved means should be made available for the exchange of information and technicians among African countries on the subject of water resources assessment and development.
- New scientific and technical studies should be adapted to the real needs of the people and to the effective possibilities of achieving project aims.
- In planning water resources, all sources of water should be considered from an integrated point of view. The same integrated approach should be applied to water needs. The programme of development should be flexible, oriented towards priorities, and should include appraisal of alternative solutions to the problems presented.

- In further investigations and development programmes, priority should be given to those projects on which implementation is most likely to be taken in a short period following their completion, either:
  - Through national or foreign financing if the pre-investment study ascertained the feasibility of the project;
  - Through self-help programmes assisted by government agencies utilizing their own personnel and equipment, with a marginal component of international assistance in terms of expertise, salaries in kind, and equipment and supplies.

Conference on hydrology and hydrometeorology in economic development of Africa

The working party noted that the above conference is to be held from 13-23 September 1971 in Addis Ababa. Organized by ECA in collaboration with FAO, UNESCO and WMO the conference has as its aim:

- To bring together representatives from data providing agencies and users of hydrological and hydrometeorological data to consider jointly the importance of such data in short-term and long-term economic development planning and how these data are used in practice in development projects;
- To give participants the opportunity to exchange experience regarding the problems involved in the collection, processing and the dissemination of hydrological, hydrometeorological and hydrogeological data in Africa;
- To consider problems of science policy and basic research connected with hydrology, hydrometeorology and water resources development;
- To consider manpower and training problems related to hydrology in its widest sense;

- To discuss inter-African and international co-operation in the fields of hydrology and hydrometeorology.

The working party welcomed the organization of this conference, which, ten years, after the Nairobi conference, will give opportunity for reappraisal of the above efforts, indispensable for the development of water resources. It recommended that Governments send delegates to the conference who would be representatives of meteorological, hydrological and other services involved in the field of water resources development. It further recommended that particular attention be given by Governments to the preparation of suitable papers to be presented at the conference so that not only the present needs and facilities be described but that plans for short and long-term development in this basic field of water resources be outlined for the benefit of economic development of African countries.

#### Water resources inventory

The working paper: "Water resources inventory as an element of the inventory of natural resources" was prepared by the Office of Hydrology, UNESCO.

During the discussion the participants stressed the importance of water inventory for the economic development of African countries. They gave examples from their own experience. The importance of ground water in particular was emphasized. Although it constitutes an essential part of water resources of Africa, its exploration and exploitation has in general not yet received the attention warranted by its importance in water resources development. The need for comparison of water demand and available water resources was also stressed.

One of the bases for economic planning is solid knowledge of the quality and quantity of the available water. Because of the mobile character of water the preparation of its inventory differs from that of other natural resources and needs longer and continuous observation and data collection.

### Recommendations

1. The development, the maintenance and the operation of hydrological and hydrometeorological networks, should be intensified to obtain enough data for the preparation of the water resources inventory. The establishment and development of networks should be done on the basis of a well prepared design.
2. In the future more emphasis should be given to the inventory, exploration, and scientific research on recharge of ground water.
3. Apart from basic hydrological data the water resources inventory should include comparison between available water resources and present and future water demand. For this reason correct determination of the available resources is needed and methods for its calculation, using hydrologic and economic data, should be investigated.

### The role of meteorology and hydrology in economic development

The working paper on this topic "The role of meteorology in economic development" was presented by Mr. S. Lewungwa, Department of Meteorology, East African Community. The representative of the WHO secretariat made a statement on the role of hydrological and hydrometeorological networks and services.

Participants emphasized the role played by hydrology and meteorology in various sectors of a national economy, with special regard to agricultural and water resources planning. Observations were also made on the importance of hydrological and hydrometeorological data for planning and proper execution of projects and the dangers and risks of designing projects with insufficient data were emphasized.

### Recommendations

1. It is necessary in all African countries to have meteorological and hydrological services organized in an integrated form or such a way that close co-operation is ensured. The basic networks of these services should be nationwide; their continuous maintenance and operation should be ensured. Adequate communication should be installed to ensure regular and prompt transmission of observed data to central processing and analysis centres, at the national and international levels.
2. Activities of African meteorological services should be extended, if this is not already the case, to be able to meet the needs for meteorological data by all sectors of the national economy. It is recommended that apart from collection and processing of basic data, hydrological and meteorological services should be able to supply such type of data as design data, planning data and real-time forecasts.
3. It is recommended that international standards in the collection and analysis of basic hydrological and hydrometeorological data be adopted.
4. It is recommended that quick dissemination of information such as day-to-day forecasts of precipitation, flood warnings, etc., be provided for a large number of interested users including small farmers. In this connexion the possibility for quantitative and long-term precipitation forecasts should be examined within the framework of the World Weather Watch System to serve farmers practising rain-fed agriculture.

### Financing of water resources development projects

The representative of IBRD presented the paper entitled: The Role of the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA), explaining the origin and the operation of both the Bank and of IDA.



Water resources projects in the developing countries could be financed from national resources, bilateral and multilateral credit or loans as well as from the World Bank. The volume of future Bank lending for water resources projects in developing countries is likely to be determined by their ability to serve the debt incurred. Present development pattern shows that investments in water resources projects may increase considerably in African countries in the foreseeable future.

In the past, Bank and IDA lending for African countries for water resources was limited to few large schemes but in the future more emphasis will be placed on financing irrigation. The Bank is prepared to finance social services and amenities such as water supply, health services, housing, when these facilities are part of a settlement scheme. Development projects in international drainage basins could also be financed by the Bank provided that the projects satisfy the Bank's requirements mentioned below. Such large schemes could also be of interest to one big lending country or a group of countries.

In order to qualify for Bank or IDA financing the water resources projects have to satisfy six different aspects of project appraisal: economic, technical, managerial, organizational, commercial and financial aspects.

The Bank, in addition to lending, provides special technical assistance to developing countries in the identification and preparation of projects and sector studies. The meeting noted the Bank has established the Institute of Economic Development to provide short courses on economic development to professionals from the developing countries by awarding each year a number of fellowships. In this institute the trainees receive intensive courses in the planning preparation, analysis and evaluation of projects in various sectors including in the fields of water resources development.

### International drainage basins

The paper prepared by ECA pointed out that the African continent possesses more than fifty international drainage basins, which together cover about 12.4 million square kilometres or about 40 per cent of the surface of the continent. The earlier treaties in respect of international rivers concerned mainly navigation or boundary demarcation. In recent years, however, treaties were concluded in respect of some river basins by which governments agreed to study in a co-ordinated way the development potential of a common basin and to consult each other regarding the use of the water and the execution of works. Examples are the treaties in respect of the Senegal river basin, the Niger river basin and the Lake Chad Basin. The implementation of these treaties is in the hands of specially set up river basin commissions.

In the discussion, participants considered the lack of adequate data on which co-operation between States in respect of resources development of international basins could be based. Often the hydro-meteorological network is not sufficient to assess fully the water resources of such basins. A first step towards development of such basins would be the collaboration between States regarding the collection, the study and the exchange of such data. This was valid for both large and small basins. The development of international river basins was expected to be a long process and is complicated by the fact that planning for economic development takes place on a national, rather than on a basin scale. Nevertheless, it was felt that co-operation in international river basin development could contribute significantly to regional development. It was stressed that agreements in respect of the apportionment of water should be based on a very careful assessment of existing water resources.

### Recommendations

1. ECA should prepare an inventory of international river basins, following criteria such as those in the Helsinki rules of the I.L.A. Such an inventory would indicate drainage areas, and a resources description as far as available data would permit.

2. A comparative study of the international agreements regarding international river and drainage basins of the continent, based on inventory of international treaties, should be undertaken.
3. International co-operation should be organized at the basin or regional levels in the case of international drainage basins through the setting up of joint basin committees, boards or commissions in order to:
  - (i) Exchange and standardize hydrologic and hydrometeorologic basic data;
  - (ii) Keep one another informed of proposed projects affecting one or more other co-basin States;
  - (iii) Initiate technical co-operation towards integrated development;
  - (iv) Pool and combine efforts to facilitate international financing and assistance;
  - (v) Harmonize water administration and national legislation among co-basin States.

#### Problems of irrigation development

The paper presented by the FAO indicates that irrigation in Africa south of the Sahara has so far played a minor role in agricultural production and development. The meeting felt that there is a need to proceed with water resources development for agriculture. This development however, should proceed cautiously, taking into account the many financial, organizational and technical constraints and the lack of trained manpower.

The importance of assistance to small-scale village type irrigation schemes, which can be easily managed and financed and in which the farmer can fully participate was particularly stressed. For such a development there is a need for simple and inexpensive diversion and distribution systems.

With respect to medium-size schemes great emphasis was placed on an integrated approach. Water resources development must be based on the studies of engineering, agricultural, technical, financial, economic, institutions, human and social aspects. Careful planning in all phases of development was regarded as of great importance. Resource surveys, preferably covering the entire basin, should be conducted in sufficient degree and detail as may be necessary for the design of complete projects. At an early stage the integrated use of precipitation, surface and groundwater as well as the re-use of drainage water should commence with the construction of engineering works. Close co-operation therefore, is needed between irrigation engineers, agronomist, and extension services. Irrigation development through state enterprise as practised in Tanzania and Sudan was discussed in detail.

The meeting gave special attention to aspects of proper water management practices at field level irrigation as well as for drainage and flood control. It was felt that often insufficient data are available to determine the economical and most beneficial use of available water and cash inputs. Better use should be made of experience obtained in existing schemes.

It was realized that adequate institutions at the farmer's or irrigator's level are necessary, in which the farmer participates and contributes. Such associations or farmer's organizations are an important means to avoid duplication, and combine efforts, unite conflicting users, and establish a close relationship and direct involvement between such organizations and the water administrations at the national and basin levels.

The meeting gave high priority to the training of manpower at all levels. The many problems connected with the generally slow acceptance of new technologies and farming practices by the farmer was recognized. It was felt that the mobilization of human resources forms a most important component in successful project realization and more attention, therefore, should be given to the education and training of the farmer and to the need for adequate information, extension services, demonstrations; in this connexion the use of modern audio-visual communication means was stressed.

Recommendations

1. Since data on optimum water management are scarce in the region, an intensive applied research component should be inserted into pilot development projects as a first step towards large scale development. In this connexion, in order to combine efforts, regional water management centres and regional applied research programmes to be oriented specifically to the needs of the African region, should be set up.
2. Since irrigation calls for important changes in the life of the farmer, and also in order to facilitate the transformation from subsistence rainfall agriculture to irrigated agriculture, support, incentives and guidance should be provided to the farmer including attention to education and training problems. Adequately functioning institutes and services such as farmers organizations, extension services, and pilot and training facilities should be provided.
3. In order to cope with the many managerial and administrative aspects in irrigation schemes, the setting up of irrigation districts and irrigation associations should be considered.
4. Irrigated state-farms, where they exist, could be used as training grounds for farmers in irrigated agricultural practices.
5. Due attention should be given to the integration of engineering, agricultural and other related services in the planning and execution of irrigation schemes. The water balance should not be neglected.
6. Socio-economic analysis of representative irrigation schemes throughout the region, should be undertaken and their results made available for distribution among interested parties concerned.

Groundwater in Africa

In the paper prepared by the Resources and Transport Division of the Department of Economic and Social Affairs of the United Nations Headquarters in New York, the importance of groundwater as a major natural resource of Africa was stressed, for practically the whole of the continent, all

the economic activities and overall social conditions. In French-speaking countries the emphasis has mainly been put on scientific surveys while in English-speaking countries, it has been on borehole drilling. The number of hydrogeologists present in Africa is about 150 to 200 while the number of rigs utilized in water drilling could be in the range of 500 to 700. The paper gives a short description of the main water bearing formations of Africa, with their yields. Some aspects of groundwater exploitation are described. The most important problems include the following: lack of technicians and equipment and of funds for groundwater investigation and exploitation, and of organization.

Recommendations:

1. Groundwater should be considered as an alternative or complementary potential source of water in any surface water development project.
2. Adequate observation networks should be organized to detect changes in groundwater resources with respect to quantity, quality and availability.
3. A preliminary survey of those groundwater bodies of Africa which are threatened with deterioration should be undertaken and appropriate methods for their safeguard (artificial recharge, modification of pumping schemes, observations of salt water intrusion) be investigated and utilized.
4. For groundwater basins involving more than one country, surveys, investigations and development should be made on an international basis.
5. All activities in groundwater exploration and exploitation should, if possible, be dealt with either by one government agency or closely co-ordinated. Groundwater technicians should be provided with all geological and hydrological data and information, and also be associated with field operations - especially drilling and pumping tests.

6. A comprehensive and comparative study of all types of methods and devices to enable economic prospecting and extraction of groundwater in Africa should be made.

#### Rural water supply

The working paper on this subject was prepared by the World Health Organization.

The goal in providing water for domestic purposes is to supply adequate quantities of better quality water in order to improve health. Activities connected with this - which in fact cannot be dispensed with - such as studies on water resources, economy, suitable equipment, and materials for water works construction can only be the means towards attaining the main goal of raising health standards.

Rural water supply programmes must be carefully planned and their planning entails difficulties which it would be wrong to disregard: logistics, variety of sources and physical conditions, inadequate supervision in construction, scarcity of mechanical equipment, community participation, and shortage of funds. The use of devices such as unit planning, standardization of equipment, training of "single-operation" work-teams, utilization of locally available skills and materials, will help to overcome these difficulties.

#### Recommendations

1. Where rural water schemes cannot be self-supporting, government should finance them. The cost of the investment should be kept as low as possible by using simplified structures, simple methods standardizing equipment and by preparing standard designs to suit local conditions.
2. While minimum quantities should be provided in order to keep costs low such quantities should be enough to encourage cleanliness and

hygiene. As the minimum requirements vary with climatic and other conditions, area studies should be made to determine such requirements.

3. As far as possible rural water supply standards should conform to the bacteriological requirements set forth in the International Standards for Drinking Water published by WHO. Regarding chemical quality, every effort should be made by governments to arrive at national quality standards according to the local situation. The control of water quality should be done in consultation with the health authorities.
4. Data relating to water consumption should be collected in each country and water requirements that could be applied in designs according to local conditions established. The forwarding of those data to international agencies would facilitate analysis and comparison with a view to a) dissemination to other countries; b) preparation of guide-lines to government planning institutions.
5. International financing institutions should study the possibility of increasing financial support for group projects of rural water supply.

#### Conservation of water resources

Working paper: "Conservation of Soil and Water on the African continent" was prepared by the Division of Natural Resources Research, UNESCO.

The paper stressed the importance of soil conservation in Africa because of the changes and intensification of agriculture in many parts of Africa.

As parts of a modern concept of soil conservation, the paper underlined the following methods:

- Careful application of equipment in farming operations, soil fixation through vegetation, especially of rapid growth plants, terracing; contour cultivation; and proper use of fertilizers.



Regarding future action, the need for an integrated approach to curtail the various effects of erosion was stressed. It was pointed out that the number and intensity of factors leading to soil erosion in Africa makes its control essential and difficult.

Lastly, the paper summarized the proposed UNESCO Programme of Man and the Biosphere; the fundamental aim of which was to ensure the rational use of natural resources.

In the discussions the participants emphasized the necessity to give proportionate consideration to water conservation; namely: water quantity, including evaporation and losses to the sea; water quality, including organic and chemical pollution, subsidence and colmatage; and water availability.

It was pointed out that all aspects of soil conservation (protection of light soils, erosion control, swamp reclamation, etc.) have close relation to water resources development and sometime involve serious economic problems.

#### Recommendations:

1. Simple means and methods of soil conservation should be developed and adapted to local conditions taking into account existing limitations in funds and qualified manpower; and farmers should be encouraged to apply them.
2. Systematic programmes of silt sampling, i.e., measurement of the sediment load of rivers, where feasible, should be undertaken as an important means of obtaining an index of soil erosion;
3. "Soil loss" maps should be published and be kept up-to-date.

#### Water policy, administration and legislation

The working paper, entitled "Water Policy, Legislation and Administration in Africa" was prepared by FAO.

During the discussion, various participants pointed out the usefulness of the preliminary survey presented by FAO as it classified certain basic

issues on the problems of water resources policy, administration and legislation.

Many participants, pointed out the insufficient co-ordination among different departments and ministries responsible for functional aspects of water resources such as water supply, hydrology, hydro-meteorology, irrigation, power, etc., which leads to a lack of adequate water policy at the national level. The need for institutionalizing and rendering obligatory such co-ordination among different ministries and departments was emphasized.

Participants pointed out the lack of an adequate water administration in their countries to ensure efficiently water utilization, particularly with respect to the creation of a central pool to collect and inventory all hydrologic and other data at the national level, for co-ordination among different projects and, for ensuring satisfactory administration of the existing water rights. The general opinion was that water resources should be declared either State or government property, or at least be brought under government control. In this connexion it was felt that water resources administration should be centralized into one single agency or department. The need for international assistance in strengthening national and basin water administrations was recognized.

Some participants pointed out that existing water legislation either was deficient, or needed a thorough critical analysis as to its efficiency. The need to study the existing situation in the field of water legislation in Africa was emphasized. Consolidation into one single water code of all legal aspects of water development and conservation was seen as desirable, and the 'appendix' of the paper presented was suggested as a possible outline for the study and preparation of a comprehensive water code.

Several participants agreed that in the case of groundwater, the licensing of drillers and the issuance of exploration permits would help to reduce problems created by uncontrolled or inefficient drilling.

The meeting agreed that water quality control, as well as land and water conservation, could be facilitated by setting up a water rights administration which would submit every use of water to a permit, authorization or concession in which technical requirements for coping with such problems could be included before actual use takes place.

#### Recommendations

##### A. At the national level

1. Each country should set up an inter-ministerial committee on water administration and legislation in order to (i) collect all existing laws including customary laws and institutions, affecting directly or indirectly water resources; (ii) critically examine their efficiency for the purpose of sound water resources development and conservation; (iii) suggest amendments, changes or consolidation; (iv) co-operate at the basin, regional and international levels in this field.
2. All existing legislation affecting various aspects of water resources should be consolidated into one single and basic water code or act; such basic legal enactment should be as simple and clear as possible and take into consideration local conditions and traditional institutions and laws.
3. National water resources Councils, Boards or Commissions should be set up in countries where they do not exist. These should include the representatives of all government ministries and departments responsible for or interested in sectorial aspects of water resources. They should be organized both at the political level (with minister's representation) and at the technical level (with representatives of technicians, economists and lawyers). Special sub-committees could be set up to study specific problems such as those recommended at recommendations 1 and 2 above. Another sub-committee on international drainage basins should be organized within these Boards where countries are co-basin States of

international drainage Basins. The actual composition of such Boards or Commissions should depend on local circumstances and needs, provided that their functions ensure an institutionalized and obligatory co-ordination.

4. In countries where this has not been yet done, existing sectorial administration which are use-or function-oriented (i.e., separate administration for specific aspects of water) should be modified towards resource-oriented administration whereby water resources are administered by one single water administration or agency. Such centralized water administration should be responsible at least for: (i) pooling all hydrologic, hydro-meteorologic and hydro-geologic data available into one central inventory; (ii) co-ordination, planning and approval of water projects; (iii) administration of water rights. The centralized water administration should be the executive organ of the national water board, council, or commission, recommended in item 3.
5. Governments are advised to initiate measures to set up local standards for the control of pollution.

B. At the international level

6. Comprehensive study should be prepared on water resources administration and legislation in Africa, for ready reference by the countries concerned. Such a study should be prepared on a continental basis country by country.
7. At a later stage, a working group of experts on water administration and legislation should be convened to consider the various studies prepared and present recommendations on basic principles involved in water resources administration and legislation; such working group should be organized on a continental basis.

#### Problems of manpower and research

In the paper prepared by ECA, attention was drawn to the fact that lack of trained manpower in the field of water resources may limit future development in water resources more than shortage of capital or other resources. Among the reasons contributing to this problem as seen by ECA, were status of personnel working in the field of water resources development vis-à-vis administrators, the existing educational systems, salary and incentives, conditions of works and problems linked with outside credit and technical assistance. It was stressed that although manpower assessment and the existing methodology for preparing projections and for targets have severe limitations because calculations are made on doubtful assumptions, they are the only tools which governments can use in estimating manpower needs.

The existing systems of education of professionals, as well as of technicians, and the possibilities for multinational co-operation for development of training facilities were explained.

Mr. Gagara, the Secretary General of the Comité Inter-africain d'études hydraulique described the purpose and the activities of his organization. The resumé of his speech can be found in annex 4 of this report.

#### Recommendations

1. Consideration should be given to a joint attempt by UN and UNESCO to assist Governments in designing undergraduate courses which, while still basically founded on civil engineering, will provide more fully for subjects such as hydrology, hydrogeology, hydraulic engineering, economics of water use, etc., that will take particular note of the needs for specialists in the fields of specializations.
2. The UN system of organizations should immediately go further to assist African States in establishing national, regional and sub-regional institutions for the training of high level manpower identified under the preceding recommendation as well as for middle and lower level technicians needed in all branches.

3. Special efforts will have to be made through international and bilateral assistance for refresher courses for all technical levels and where practicable for attachment to projects or institutions in other countries.
4. National engineers should be given the opportunity to acquire experience during investigation, planning, design and execution stages of water development projects. Since most of these projects are entrusted to foreign consulting firms, Governments should whenever possible make provision in their contracts with these firms for the training of national personnel during these stages.
5. Where African counterparts are attached to expatriate working in the field of water resources development, some mechanism must be created to ensure that there are actual and meaningful transference of skills as this should be one of the expatriates' primary responsibilities in their fields of competence.
6. Salary scales, promotion systems and incentives for those who work in the technical fields should take into consideration the nature of their work in hardship areas as well as their scarcity.
7. It is recommended that fellowships offered by UN organizations should be flexible enough to accommodate full time undergraduate courses.
8. In view of the inadequacy of trained, qualified personnel, it is recommended that one or more regional training centres on water resources administration and legislation be organized with international aid; such training centres should be organized possibly on a regional basis. In any case, it is recommended that training in water resources administration and legislation be provided in those national and regional institutions where the studies on technical, and economic aspects of water are carried out.

Water resources development and social welfare

The paper on "Water Resources Development and Social Welfare" was introduced by the author, Prof. G. White. It suggested that water development is only one of the tools available to serve such social aims as national economic efficiency, regional development, and preservation of environmental quality. Four of the more common reasons it may fall short of reaching those goals are: (1) failure to compare proposed projects with other possible alternatives, including non-structural measures such as flood warnings and land use regulation; (2) lack of planning of the full complement of auxiliary measures needed to achieve the expected results; (3) premature initiation of major works; and (4) failure to canvas the full range of social and ecological consequences of proposal measures. Some possible ways of correcting these difficulties in African conditions were noted.

The participants analysed the social welfare questions connected with African water resources development, often citing concrete examples. In the light of findings from the social sciences and of criticisms made during recent years about development projects which have not always had beneficial effects for man, the participants thought it necessary to make the following points:

Projects of an individual character or designed for small social groups in certain cases may turn out to be more beneficial than large-scale development projects. Consideration of such projects is useful, because they can often help to solve social and psychological problems more effectively.

Since the African countries' financial resources are limited, it is sometimes essential to reach a compromise between the need to take into account all social and ecological factors and standards of profitability.

Financing bodies should change their approach, and small projects should be given as much attention as large ones. Moreover, it is for the African nations to lay down their own priorities and to take on full responsibility in the field of social welfare.

### Recommendations

1. In designing water development projects, account should be taken of all relevant factors covering any measures that might help to attain objectives of a social nature.
2. Prior consultation with the direct beneficiaries is essential before completing water plans. Close collaboration should be maintained between all concerned so as to avoid unforeseen and regrettable contingencies and failures.
3. Studies should be carried out to evaluate the full results of water resource projects after their completion. The cost of such studies should be included in initial estimates for the projects, since separate financing is hard to obtain.

### Preparation of a publication on water resources planning

Discussion took place on the subject of an outline for a book on planning of water development in Africa, to be issued at a later time by ECA. The purpose of the publication would be to assist those responsible for policy and planning of water resources as a part of social and economic development in their respective countries.

The Working Group was clear about a number of the characteristics it does not want the book to have. The book should not be a general textbook on water planning. It should not attempt to give detailed descriptions of the varied environments of Africa. It should not contain detailed statements of each nation's current water planning activity, but selected published water plans may be submitted as case studies. It should not attempt to give estimates of total water supply and water uses or needed expenditures. It should not try to summarize standard procedures already available in print. There was general agreement on the need for the preparation of a publication in respect of water resources planning in Africa. There was substantial agreement on the main elements to be included in the outline of such a publication. The principle topics were: Water quantity and quality as a



natural resource, its distribution in space and time; Water use; Appraisal of priorities in demand, Studies of alternative measures; Design of the feasible project, Institution, organization and personnel; Financing; subject to the following suggestions:

It was suggested that the outline should be regarded as a framework of topics each of which would be treated from the standpoint of African experience and problems. An opening chapter should stress the distinctive environmental context in which water occurs and is used on the African continent. Individual statements should be substantiated so far as practicable from experience in Africa. Wherever suitable, case studies should be presented or quoted. Rather than trying to issue a series of discrete summaries, the elements in water planning should be treated in relation to each other. The emphasis should be on ways of improving the interplay of these factors in the continuous planning process for economic and social development rather than on individual techniques. The arrangement of items in the outline is not to be taken as implying a prescribed order of action: they must be considered simultaneously. The possibility of a separate volume of case studies was noted.

On matters of substance, it was suggested that attention also be given to atmospheric resources. Attention should be directed to the importance of basic studies, including the types of socio-economic studies, and to appraisal of the present situation affecting development. The need for careful documentation and historical work should be recognized. The complexities of working out a full plan of operation should be recognized. These and other suggestions may lead to a reorganization of the outline in the course of preparing the text.

It was agreed that ECA draw on the proceedings to this meeting as well as on new materials prepared by the experts and specialized agencies. ECA staff would circulate the draft of the book to experts and concerned people in African countries for comments and amendments and then the amended draft would be published, drawing, if necessary, upon a special editorial sub-committee for advice on the final version. It would acknowledge the contributions made by individuals and agencies.

It was agreed that every effort should be made to have this publication ready in two years time.

Recommendations

The ECA secretariat should be provided by member States with all useful information regarding water resources planning in the various countries including information regarding the effective implementation of the water resources development plans, the difficulties and the achievements.

If possible, copies of the documents (such as consultants and departmental reports) concerning planning of water resources on a basin or regional basis should be communicated to ECA.

The information gathered will help ECA in the preparation of the document "Planning of Water Resources Development in Africa" which is expected to benefit all African countries.

ANNEX I

LIST OF PARTICIPANTS IN THE WORKING GROUP  
ON WATER RESOURCES PLANNING

Ethiopia

Ato Hailu Yemanu, Manager, Department of Economic Infrastructure,  
Planning Commission, Addis Ababa, Ethiopia.

Ato Yilma Wolde Emanuel, Chief of New Basins Studies, Water Resources  
Department, Addis Ababa, Ethiopia.

Morocco

M. Mokhtar Bzioui, Ingénieur, Ministère de travaux publics, Rabat, Maroc.

M. Chaoui, Ingénieur en Chef à la Direction de l'Hydraulique, Ministère  
de travaux publics, Rabat, Maroc.

Sudan

Mr. Saghayroon El Zein, Irrigation Adviser, President, Permanent Joint  
Technical Commission on Nile Water, c/o Ministry of Irrigation & H.E.D.,  
Khartoum, Sudan.

Tanzania

Mr. F.K. Lwegarulila, Director, Water Development & Irrigation Division,  
Dar-es-Salaam, Tanzania.

UAR

Dr. Abdel Fattah Fahmy Mohamed, Under-Secretary of State, Ministry of  
Irrigation, Cairo.

Uganda

Mr. Denis G. Kabega, Commissioner of Water Development, Entebbe, Uganda.

Mr. J.B.K. Ulayeneza, Assistant Secretary, in charge of Water Section,  
Ministry of Minerals and Water, Kampala, Uganda.

Zambia

Mr. G.A.N. Starmans, Chief, Hydro-Engineer, Department of Water Affairs,  
Lusaka, Zambia.

CIEH

Mr. Gagara, Secrétaire général du Comité inter-africain d'études hydrauliques, Ouagadougou, Haute-Volta.

Commission du Fleuve du Niger

Mr. G. Kakadie, Président de la Commission du Fleuve Niger, Directeur de l'Hydraulique, Abidjan, Côte d'Ivoire.

United Nations Secretariat

Mr. Robert Dijon, Technical Adviser, Water Resources Section, Resources and Transport Division, New York, USA.

FAO

Mr. Dante Caponera, Chief, Legislation Branch, FAO, Rome, Italy.

Mr. Cornelis Des Bouvrie, Regional Officer for Land and Water Development, FAO Regional Office, Accra, Ghana.

Mr. J. Doorenbos, Technical Officer on Irrigation, FAO, Rome, Italy.

UNESCO

Mr. J. Herakovich, Programme Specialist, Office of Hydrology, UNESCO, Paris, France.

Dr. Gyorgy Kovacs, Programme Specialist, UNESCO Field Science Office for Africa, P.O. Box 30592, Nairobi, Kenya.

IBRD

Mr. Eric M. Sicely, Agriculturalist, IBRD, Washington, DC, USA.

WHO

Mr. Max Roy, WHO Sanitary Engineer, Liaison with ECA, P.O. Box 3050,  
Addis Ababa.

WMO

Prof. J. Nemeč, Chief, Hydrometeorology Division, Geneva, Switzerland.

ECA

Mr. G. Dekker, Regional Adviser, Water Resources Development, Addis Ababa.

Dr. Kamal Riad, Hydraulic Engineer, Water Resources Section, Addis Ababa.

Consultants

Mr. S. Tewungwa, Director-General, Department of Meteorology, East African  
Community, P.O. Box 30259, Nairobi, Kenya.

Prof. Gilbert F. White, Institute of Behavioral Science, University of  
Colorado, Boulder, Colorado, 80302, USA.

ANNEX II

AGENDA

15 June 1970

Monday

Working Papers

Morning: Opening Speech by the  
Executive Secretary of ECA  
Election of Officers  
Discussion and Adoption of Agenda

Afternoon: Water resources inventory  
Water resources inventory  
as an element of the  
inventory of natural  
resources (WRD/CONF/7)

16 June 1970

Tuesday

Morning: The role of meteorology and  
hydrology in economic  
development  
The role of meteorology  
in economic develop-  
ment (WRD/CONF/13)

Afternoon: Financing of water resources  
development projects  
The role of the Inter-  
national Bank for Re-  
construction and Develop-  
ment (IBRD) and the  
International Develop-  
ment Association (IDA)  
(WRD/CONF/1)

17 June 1970

Wednesday

Morning: International drainage basins  
A note on the develop-  
ment of international  
drainage basins  
(WRD/CONF/2)

Afternoon: Problem of irrigation develop-  
ment  
Irrigation development  
in Africa South of  
the Sahara

18 June 1970  
Thursday

Morning:	Groundwater in Africa	Underground water in Africa (WRD/CONF/9).
Afternoon:	Rural water supply	National rural water supply programmes (WRD/CONF/5).

19 June 1970  
Friday

Morning:	Conservation of water resources	Conservation of land and water resources in Africa (WRD/CONF/8)
Afternoon:	Lectures on the Awash basin in Ethiopia and on water development in Morocco	

20 June 1970  
Saturday

Field trip

21 June 1970  
Sunday

Field trip

22 June 1970  
Monday

Morning:	Water policy, administration and legislation	Water policy, administration and legislation in Africa (WRD/CONF/4).
Afternoon:	Problems of manpower and research	Manpower and training problems in water resources development. (WRD/CONF/6), prepared by C.I.E.H

23 June 1970  
Tuesday

Morning:	Water resources development and social welfare	Water resources development and social welfare (WRD/CONF/12)
Afternoon:	Recommendations on programme of action related to water resources development	

24 June 1970  
Wednesday

Morning: The outlay of a publication on  
problems of water resources  
development in Africa

25 June 1970  
Thursday

Morning: Drafting groups

Afternoon: Discussion and approval of report.



ANNEX III

LIST OF DOCUMENTS

- |     |   |             |
|-----|---|-------------|
| 1.  | Water Resources Development in Africa by IBRD and IDA.  | WRD/CONF/1  |
| 2.  | A Note on the Development of International Drainage Basins - by ECA.  | WRD/CONF/2  |
| 3.  | The Helsinki Rules on the Uses of the Waters of International Rivers - by ECA.  | WRD/CONF/3  |
| 4.  | Water Policy, Administration and Legislation in Africa - by FAO.  | WRD/CONF/4  |
| 5.  | National Rural Water Supply Programmes - by WHO.  | WRD/CONF/5  |
| 6.  | Manpower and Training Problems in Water Resources Development - by ECA.   | WRD/CONF/6  |
| 7.  | Water Resources Inventory as an Element of the National Inventory of Natural Resources - by UNESCO.   | WRD/CONF/7  |
| 8.  | Conservation of Land and Water Resources in Africa - by UNESCO.   | WRD/CONF/8  |
| 9.  | Groundwater in Africa - by UN Resources and Transport Division, Headquarter.  | WRD/CONF/9  |
| 10. | Agenda.   | WRD/CONF/10 |
| 11. | Irrigation Development in Africa, South of the Sahara - by FAO.   | WRD/CONF/11 |
| 12. | Water Resources Development and Social Welfare - by Prof. Gilbert F. White, Institute of Behavioral Science, University of Colorado, Colorado, USA. | WRD/CONF/12 |
| 13. | The Role of Meteorology in Economic Development - by S. Tewungwa, East African Community.   | WRD/CONF/13 |

ANNEX IV

EXTRACT PREPARED BY THE REPRESENTATIVE OF THE CIEH  
FROM HIS STATEMENT TO THE ECA WORKING GROUP  
ON WATER RESOURCES DEVELOPMENT PLANNING

The joint memorandum by the Inter-State School of Rural Engineering and the Inter-African Commission on Hydraulic Studies, presented by the Secretary-General of the Water Resources Development Institute at the meeting of the Working Group on Water Resources Development Planning in Africa concerning the possibility of establishing a "Water Resources Development Institute for West and Central Africa", clearly demonstrates that such an institute can be established only on the basis of existing inter-State agencies. There are already three complementary inter-State agencies, with headquarters at Ouagadougou: the Inter-State School of Rural Engineering, the Inter-African Commission on Hydraulic Studies, and the School for Rural Engineering Technicians, at Saria. All three agencies require some improvements, to be fully capable of performing the normal functions and services of a Water Resources Development Institute, namely to:

- give training at all levels and in all branches;
- provide Governments of the sub-region with advisory services on water resources problems;
- disseminate information on different aspects of water resources development;
- carry out applied research on matters of joint interest.

So far the WRDI has certainly done its work of:

- arranging exchanges of technical information on water resources development;
- identifying the general scientific and technical studies that are of joint interest, evaluating the possibilities of financing them, promoting such studies and publishing the results;

- advising member States and giving them all necessary technical aid in carrying through or supervising projects.

The fact remains that the only way of solving the various water resources development problems in the interest of the peoples of West and Central Africa is through a combination of these three agencies. The United Nations bodies are therefore requested to study closely this sensible formula for regional co-operation based on present-day realities.

Everything possible must be done to achieve this combination. The administrative authorities of the three agencies should discuss the advisability of this step at their next meeting.