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International Co-operation with respect to Water Resource Development

Report by the Secretary-General

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I. INTRODUCTION

1. An interim report^{1/} was submitted by the Secretary-General to the Council at its eighteenth session pursuant to Council resolution 417 (XIV). It was prepared in the light of preliminary consultations held with the specialized agencies most immediately concerned and of exploratory discussions with specialists attached to other organizations.
2. The interim report noted that in many areas the supply of water is proving inadequate to meet the growing demand and stressed the tendency of water requirements in many instances to increase faster than the population. The increasingly serious shortage of water is a deterrent to economic growth; the situation, it was pointed out, calls for full knowledge of all water resources, surface and underground, and for their management in a fashion permitting maximum benefit being derived from them.
3. The interim report singled out three areas in which it was felt that international action could and should be taken early: (a) the gathering and analysis of hydrological data, (b) the extension of knowledge of the techniques of watershed management, and (c) the necessity for considering industrial needs in any over-all water planning that might be undertaken.
4. The interim report then examined ways and means of integrating and co-ordinating activities at different levels. At the country level, it recommended the organization of comprehensive national water boards, while at the regional level it emphasized the role which could be played by the Regional Economic Commissions. For the achievement of a flexible and continuous co-ordination at the international level of all relevant activities of the organizations within the United Nations family, it suggested the holding of inter-agency meetings at regular intervals. Finally, the report recommended that technical conferences be convened from time to time in order that experts in the various aspects of water development and utilization might be enabled to exchange experience and views.)

^{1/} "Development and Utilization of Water Resources" (E/2603).

5. The analysis contained in the Secretary-General's interim report, its conclusions and suggestions for action met with wide acceptance in the Council and led to the unanimous adoption by the Council of resolution 533 (XVIII) which requested that the Secretary-General (a) pursue along the lines suggested in his report the endeavours towards strengthening international technical co-operation of the related activities of all concerned; (b) consult with governments having special experience in these matters, with the inter-governmental bodies concerned and with interested non-governmental organizations on ways and means of achieving this objective; and (c) report to the Council on the results of these consultations, and formulate recommendations on appropriate further action by the United Nations organizations, not later than in 1956.

6. Chapters II and III of the present report review the progress made during the past two years at the international and regional level; chapter IV singles out some important problems for further consideration by the United Nations. The appendix analyses activities of the United Nations organizations during recent years in the field of water resources.

II. PROGRESS IN INTERNATIONAL CO-OPERATION: THE WORK OF THE INTER-AGENCY MEETINGS

Inter-Agency Meetings on Water Questions

7. As a step towards implementation of Economic and Social Council resolutions 417 (XIV) and 533 (XVIII), in so far as they relate to international co-operation in and co-ordination of activities of the United Nations organizations in matters of development and utilization of water resources, the First Inter-Agency Meeting was convened by the Department of Economic and Social Affairs at Geneva during the concluding days of the eighteenth session of the Council to follow up the suggestions made in the Secretary-General's interim report submitted to that session.^{2/}

^{2/} Op.cit., paras. 49-51.

8. The meeting was attended by Secretariat members directly concerned with water matters in the United Nations Department of Economic and Social Affairs, the Technical Assistance Administration (TAA), the Economic Commission for Europe (ECE), the Food and Agriculture Organization (FAO), the International Bank for Reconstruction and Development (IBRD), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the World Health Organization (WHO), and the World Meteorological Organization (WMO).

9. The wide scope of the problems connected with water conservation and utilization was taken fully into account at this meeting, and it was recognized that an integrated approach to these problems was likely to lead to the most fruitful results. Consequently the First Inter-Agency Meeting laid the basis for close co-operation at the working level between the various United Nations agencies and services concerned with water questions on an international plane. Unanimous agreement was reached on arrangements for improving the exchange of information on water resource projects, research programmes and related activities. It was proposed that a central repository of such information be established when possible by the Secretariat at United Nations Headquarters. Agreement was also reached on arrangements for inter-agency co-operation in the study of matters bearing on the development and utilization of water resources and in the preparation of handbooks; on arrangements for assembly and study of data on water problems in substantive fields and in geographic areas not then covered or only partially covered by United Nations organizations; and on steps to promote co-operation in water questions with international scientific and technical organizations outside the "United Nations family".^{3/} It was decided that inter-agency meetings on water questions similar to this first one should be held at least once a year to review past activities and to consider action programmes and plans.

10. The Second Inter-Agency Meeting was convened at Geneva a year later (2-4 August 1955). The same organizations participated; in addition, the Secretariat of the Economic Commission for Latin America sent a written

^{3/} Eighteenth Report of the Administrative Committee on Co-ordination to the Economic and Social Council (E/2728, paras. 16-18).

communication expressing the keen interest of the countries in the region on water resource development problems. A review was made of the work initiated during the previous year in such domains as hydrology, preparation of handbooks and consultation with governments and international scientific and technical organizations interested in the field of water resources. Problems related to further possible action in respect of legal questions, the question of providing training facilities in integrated water resource development and the utilization of saline water were discussed.

11. The progress achieved during the past two years as a result of the Inter-Agency Meetings is briefly reviewed below. It may be noted that the meetings have proved useful in providing an international framework for the exchange of views among the participants and in initiating and strengthening co-operation in the study of water problems.

Organization and Collection of Hydrological Data

12. Promoting the collection, analysis and exchange of hydrological data has been recognized by the Council as of vital importance. The common view expressed at the eighteenth session was that WMO is the appropriate body to assume primary international responsibility in this field. During the Inter-Agency Meetings WMO was urged to explore the feasibility of assuming such responsibility. It was pointed out that the role of WMO should include rendering of assistance to governments in the planning and organization of hydrological services, in the training of personnel for the compilation and analysis of hydrological data, and in the procurement of suitable equipment.

13. More recently the question was discussed at the Second World Meteorological Congress as constituting part of the WMO programme on water resource development. The Congress adopted a resolution^{4/} stating that WMO would be prepared "to accept responsibility of being recognized as a specialized agency of the United Nations dealing with those aspects of the

^{4/} Resolution No.24.

water resource development programmes of the United Nations and the specialized agencies which fall within the common ground between meteorology and hydrology. Within this field WMO will be prepared to meet specific needs at the request of the United Nations or other specialized agencies." The resolution also directs the Executive Committee to prepare a WMO programme "calculated to meet the needs of the United Nations and specialized agencies". At the subsequent meetings of the Executive Committee it was decided to establish a Panel of Experts on Water Resource Development.

14. This panel is available for consultation by the Secretary-General of WMO and has been requested to prepare a programme of activities related to hydrology.

15. Meanwhile WMO has carried out inquiries among governments with a view to providing its secretariat with the necessary background information for making recommendations to the Congress on the organization's future hydrological work.

16. This beginning toward fixing major responsibility in connexion with hydrologic data is encouraging; it is hoped however that the final programme of WMO will meet to a larger extent the requirements of those in charge of appraising water resources at various stages of the hydrological cycle.

Preparation of a handbook on watershed management

17. The importance of improved watershed management and the lack of adequate knowledge of the subject not only on the part of the general public but also among those who make political and economic decisions at the national level was stressed in the Secretary-General's interim report to the eighteenth session of the Council. The usefulness of a basic handbook on these questions was unanimously recognized during the Inter-Agency Meetings. It was felt that FAO should assume the main responsibility for the study of watershed management in all its aspects, including its relation to erosion control, upstream water management and the use of farm and forest and range lands, for building up a body of requisite documentation, for advising on appropriate techniques adaptable to variations in local conditions and for

promoting exchange of related information. UNESCO, on the other hand, agreed to be responsible for the part of the handbook concerned with the promotion of a broad educational programme related to watershed management. Accordingly, an outline of the handbook has been prepared by FAO. It is expected that the handbook itself will be completed by the beginning of 1957.

Outline Study on Industrial Uses of Water

18. The problems associated with the increasing use of water for industrial purposes, together with the need for study of the methods of using water in industry, were raised at the First Inter-Agency Meeting. The United Nations Secretariat was asked to prepare a preliminary study on this subject along with a bibliography.

19. This study which has been prepared and circulated to governments and institutions draws attention to the rate of increase in demand for water in industry. It assembles and interprets factual data on industrial water requirements as to quantity, quality and cost of supplies, and presents suggestions. Some of these suggestions, particularly those relating to the technique of conservation and re-use of water, should be of relevance in areas where the difficulties of expanding water supplies are threatening to hold back industrial growth. The study also examines implications of the competitive use of water for industrial and other purposes. Finally, water policies are considered from the national as well as the international viewpoint.

20. Although the preliminary study chiefly analyses data pertinent to the United States, it provides the basis for a more comprehensive report. This report, prepared with the help of the comments and additional data sent by governments and institutions upon examination of the present study, would include statistics and information on the experience and particular needs of various other countries.

Outline Study of National Water Boards or Commissions

21. The United Nations Secretariat was also requested at the First Inter-Agency Meeting to initiate a study on water boards as proposed in the Secretary-General's report.

22. It was felt that, as a preliminary step to a comprehensive study of national integration and co-ordination, it might be advisable briefly to analyse organizational problems on the basis of experience gained in industrialized countries in which water resources have already been extensively developed. Such an analysis would emphasize the time lag by which the development of organizational forms for the co-ordination of water resource functions has failed to keep pace with the technical developments in the field of water resource utilization. It would then consider the purpose of national water boards, their organization and place in government administration.

23. It is hoped that the preliminary study will be ready for circulation to governments by the middle of 1956. As in the case of "Industrial uses of water", the governments will be requested to send comments and additional information. Subsequently a comprehensive report will be presented to the Council.

Co-operation in water questions with international scientific and technical organizations

24. Special attention was given during the Inter-Agency Meetings to the relations with the various international scientific and technical organizations concerned with water questions. Each participant was asked to list the organizations with which close contact was maintained. It was recognized that considerable benefit had already been gained in specific matters from the co-operation between governmental and non-governmental bodies. It was felt, however, that co-operation could still be improved and it was proposed that a central roster of organizations and technical personnel be maintained in the United Nations Secretariat which would also be responsible, staff and time permitting, for the continuous assembly and periodic distribution of information regarding forthcoming conferences, symposia and programmes of research of the international scientific and technical organizations outside the United Nations family.

III. REGIONAL CO-ORDINATION

25. Three types of regional co-ordination of work on water were discussed in the last report of the Secretary-General:^{5/} (i) encouragement of collection of basic data and formation of standards of accuracy; (ii) study of regional conditions in all important water phases; and (iii) exchange of related information and experience.

26. An account is given below on the developments which have taken place along these lines during the past two years in the work of the Economic Commission for Asia and the Far East (ECAFE) and in that of the Economic Commission for Europe (ECE) and of the efforts being presently made in Latin America as well as in the Middle East and Africa.

ECAFE

27. In compliance with the request of the Regional Technical Conference on Water Resource Development, held in Tokyo in May 1954, and with resolution 533 (XVIII), of the Economic and Social Council, the secretariat of ECAFE has decided to undertake together with WMO a joint study on the main deficiencies in hydrologic data in the ECAFE region. This subject was discussed together with the question of hydrologic terminology by a working group of experts which met at ECAFE headquarters in Bangkok in September 1955.

28. The long term programme of work on flood control and water resource development includes the preparation of a manual on river basin planning, country surveys of water resource development, special studies and promotion of co-operation in the development of international waters.

29. Considerable progress has been made on these projects since August 1954, particularly on the manual on river basin planning which, presented in a preliminary form at the regional conference at Tokyo, was completed and published in January 1955.^{6/}

^{5/} E/2603.

^{6/} United Nations, Multiple-Purpose River Basin Development, Part I, Manual of River Basin Planning (Sales No.:1955.II.F.1).

30. Country surveys of water resource development have been completed for Ceylon, China (Taiwan), Japan and the Philippines; others are under way for Burma, Cambodia, India, Laos, Thailand and Vietnam. Similar surveys for Indonesia and Pakistan are being prepared by ECAFE in co-operation with experts designated by the respective governments concerned.

31. A study was initiated on methods of handling earth work. Two countries, India and Japan, presenting different characteristics with respect to such work, have been chosen for the initial stage in the study. Preparatory work on the sediment problem is being pursued.

32. Increased regional co-operation is envisaged in the study of international rivers in the ECAFE region with special regard to flood control, water uses, irrigation and power generation. As a first step the study of the lower Mekong River basin was initiated in 1951 with the co-operation of the technical departments of the countries concerned. Since its establishment, one of the major functions of the Bureau of Flood Control and Water Resources Development has been "to promote the exchange of information among Member Governments and the various national and regional organizations, either through reciprocal communication reports or documents, or by exchange and bringing together of experts". Accordingly the Bureau undertakes field investigations of methods of flood control in major areas in the region. It publishes a series of publications known as the "Flood Control Series" and issues reports on a number of specific water problems of interest to the region.

33. Considerable effort was directed towards the organization of a training centre for integrated water resource development. Since November 1954, consultations held with the Government of India and various technical assistance organizations have revealed that by utilizing the existing facilities in Roorkee University and the opportunities for study provided by multi-purpose projects under construction in the country, a training centre might with advantage be organized by the University in co-operation with ECAFE, TAA and the United States Mission. The Centre started functioning recently and is open to trainees from Asia and Africa. The Flood Control and Water Resources Bureau has assisted the University in the formulation of a curriculum, helped in the recruitment of trainees and is providing short-term lecturers.

34. As a medium for dissemination of technical information on all aspects of multi-purpose water resource development the Bureau issues a quarterly magazine known as Flood Control Journal and acts as a clearing house for exchange of technical literature among various countries of the region.

ECE

35. The main preoccupation of ECE under this heading lies in the field of hydroelectric power. The programme of the Committee on Electric Power includes basis studies and inquiries for the determination of the hydroelectric resources of Europe; for the optimum development and use of water resources of common interest to two or more countries; and for promoting the exchange of power.

36. The ECE secretariat has completed a study showing the total water power resources of a number of European countries and discussing their economic potentialities, and has been requested to extend this inquiry to certain countries not yet covered.

37. Work on the optimum development facilities utilizing common water supplies led to the successful conclusion, in May 1954, of an agreement between Austria and Yugoslavia concerning the use of water in plants situated on the Drava river. Provision is made for a joint commission to deal with future operating problems. An intergovernmental body known as "Yougelexport" has been set up under the auspices of ECE to investigate prospects for the harnessing of water power sites with a view to exporting power from Yugoslavia to neighbouring countries.

38. In Europe the economic advantage of exchanging electric power results mainly from variations in the flow of power-producing rivers. Work now in progress on the study of factors which underlie such exchange includes an investigation into fluctuations in dry and wet conditions over a period of years in various European countries. On the same subject, another study is in progress which deals with the seasonal distribution of water power resources in winter and summer periods.

39. The Economic Commission for Europe and more particularly its Committee on Electric Power have been dealing during recent years with legal problems concerning the control and development of water power resources.^{7/}

^{7/} United Nations, "Legal Aspects of Hydro-Electric Development of Rivers and Lakes of Common Interest" (Geneva, 1952; mimeographed).

40. With respect to the hydroelectric development of rivers of common interest, it has proved necessary to distinguish between boundary rivers and "successive" rivers. In the case of boundary rivers the work of the Committee has resulted in a recommendation addressed to the Governments of different European countries, proposing a number of measures in the field of taxation, administration and customs tariffs, with a view to facilitating the problems related to the exportation of energy produced and particularly the legal position of the common concessionaire. In the case of "successive" rivers certain general principles are beginning to emerge but the Committee feels that it is still premature to hope for the elaboration of a general convention; convinced that every case should be examined separately, the Committee requested the secretariat to act as an intermediary between governments that might ask for assistance in connexion with the conclusion of bi- or multi-lateral agreements.

41. The Committee on Electric Power has also been interested in a comparative study of concession rights in the matter of hydroelectric energy in different European countries. A certain amount of documentation has been assembled on the subject.

42. Another problem arises when certain countries possess water resources whose productive potential is likely to exceed for a long time their domestic needs. Such resources therefore constitute a natural reservoir which may be exploited to assist neighbouring countries which are less privileged.

Intergovernmental study groups under the auspices of the ECE have been created for dealing with such cases.

ECLA

43. During its sixth session in Bogotá in September 1955, the Economic Commission for Latin America adopted a resolution in which it recommended inter alia that the secretariat "carry out a preliminary examination of the situation of water resources in Latin America, their present utilization in so far as possible for multiple purposes, such as energy, irrigation, water supply, land reclamation, drainage and other benefits arising from the construction of such works and the use of water and their prospects for future use."^{8/}

44. Prior to this resolution, the activities of the Commission bearing on water resources were mainly related to the development of hydroelectric power, but some studies on development projects undertaken by the ECLA secretariat for some Latin-American countries also dealt with irrigation problems.

45. A preliminary general survey of energy resources and development was submitted to the sixth session of ECLA in September 1955. With a view to future development, a first appraisal of the potential energy resources has been made; among them are water power resources of great magnitude, some of which may be used by more than one country. A projection of energy requirements over the next ten years has been made for certain countries.

46. In Central America, a study of electric-power development was made in 1953-54 by a TAA Mission, in consultation with ECLA, under the Central American Economic Integration programme. The survey included an examination of existing facilities, the probable trends of demand and the immediate hydroelectric potential. Recommendations were made by the experts on basic hydrologic studies required and on specific projects that could be developed in the short and in the long run, particularly hydroelectric power projects. The survey also included some projects concerning joint utilization of power by more than one country. A ten-year programme of expert assistance was drawn up to aid the governments in furthering the electric power supply in the region.

47. Water resources were also considered in an ECLA/TAA report on transport in Central America carried out in 1952-53^{9/} which included preliminary information on inland water ways.

Middle East and Africa

48. Questions related to the study of water problems in the Middle East and Africa, were discussed during the two inter-agency meetings.

^{9/} United Nations, "Transportation in Central America" (E/CN.12/356).

49. A considerable amount of technical assistance in the domain of water has been rendered by TAA and the specialized agencies in various countries of the Middle East and to a lesser extent in Africa. However, no systematic study of regional conditions has been initiated. One possible effort in this direction would be to start centralizing the pertinent data and information; this might be undertaken by the Bureau of Economic Affairs. An analysis of available information regarding water development in Africa has been initiated with the purpose of preparing a review of water problems in the general context of economic development in this region. It is expected that this study will be completed in the summer of 1956 and submitted to the Council as a supplement to the World Economic Report.

50. Another means of amplifying the information on water resources in the Middle East and Africa would be the holding, under United Nations auspices, of seminars in which interested government authorities and non-governmental institutions might participate. The purpose would be to examine specific water problems confronting areas and countries of these regions and to enlist the support and co-operation of the participants in properly organized, continuous assembly of basic information. One such seminar has already been held - the Near East Regional Meeting on Irrigation and Drainage Practices, convened by FAO, in Teheran, Iran in November 1954. The purpose was to discuss the common problem in that area of deterioration of irrigated lands.

IV. PRIORITIES FOR FURTHER ACTION

51. In the light of experience gained during the last few years both inside and outside the United Nations organizations, a few conclusions can be drawn as to future action. Distinction may be made between problems which, although important, are not ripe for global measures, and problems which are suitable for immediate and international action.

52. Several of the former problems have already received the attention of the economic commissions, the specialized agencies, certain international scientific organizations or of governments. Three such problems which may be of interest to the Council are briefly described below.

53. Some efforts have been made to overcome the striking deficiency in trained, competent technicians able to plan and undertake hydrologic control measures in under-developed countries. In particular, there is the centre at Roorkee University, India, to which reference has already been made, for training in multiple purpose water resource development. The centre aims to provide engineers concerned with water resource and power development with advanced training in modern technical methods as well as understanding of the economic and social impact of the various measures involved in multiple purpose development. Seminars are also sponsored by FAO.
54. Action has been taken in several regions on problems raised by the full utilization of international rivers for the benefit of all interested countries. Where two or more governments are involved in the possible development of a river basin, problems of planning and execution are greatly increased. A major difficulty in the case of international rivers revolves about variation in measurement units, standards, and organization for the collection of hydrologic data. Another difficulty may arise in the organization of regular transmission of hydrologic and meteorological information. The early prediction of floods depends on the swift transmittal of such information from upstream to downstream danger points. Finally, special arrangements may be needed to secure the full co-operation of the countries concerned in financing studies and collection of data related to unified river basin development.
55. A further problem to which attention is to be drawn is the utilization of saline water. Four factors have raised the interest in this question: the increased requirements of water in some countries threatening to exhaust the available fresh water supplies in the foreseeable future, the increase in salinity of fresh water supplies in many areas, the existence of large brackish water supplies, and the growing practical use of saline water especially in industry. Saline water may, under certain conditions, be used in industry unprocessed or mixed with a certain proportion of fresh water and it can be demineralized to raise the supply of fresh water. Research on the desalting of saline water is kept under review by UNESCO through its arid zone programme and efforts to develop practical means for saline water conversion are systematically pursued especially in the United States and in Europe. The

technological processes involved may not be universally applicable and several methods have been or are being developed in order to meet specific local conditions and requirements. The need for comparative studies on water economics in arid zones was emphasized at the International Arid Land Conference, New Mexico, April-May 1955, sponsored by UNESCO.

56. Among the problems calling for systematic international action and high priority, the following are suggested for consideration by the Council: (a) the determination of hydrologic data deficiencies, especially in under-developed areas; and (b) the implications - economic, social and administrative - of integrated river basin development. A brief analysis of these two questions and suggestions for possible appropriate steps follows.

Deficiencies in Hydrologic Data

57. In most countries the control and utilization of water resources, essential for economic development, is hampered by the absence of indispensable information. Ignorance in this field may be costly, holding up the development of, for example, such essential works as flood control, irrigation and hydro-projects. The lack of water management data may delay the preparation of needed plans for many years or when plans are based on incomplete information, applications for loans may be rejected. Compared to the possible losses associated with deficiencies in water records, the cost of providing for measurement is small.

58. This problem was recognized by the Economic and Social Council which recommended that governments and appropriate United Nations organizations give particular attention to the assembly of hydrologic data.^{10/} However, the latter cannot be properly initiated without a preliminary inquiry on existing hydrologic services as well as on plans for their future extension in the countries concerned. Only such an approach can reveal where and why deficiencies in hydrologic data occur and form the basis of proper action to remedy them.

59. Although it is essential, in tackling the problem of hydrologic data deficiencies, that certain measures be undertaken by each individual country, a joint effort by a group of countries comprising a region is likely to give more comprehensive and co-ordinated results.

^{10/} Resolution 533 (XVIII).

60. A successful instance of action on a regional level has recently been provided. This was the meeting, referred to earlier, of a working group of experts convened jointly by the Economic Commission for Asia and the Far East and the World Meteorological Organization. The object was inter alia to deal with deficiencies in hydrologic data in the ECAFE region. Questions discussed were facilities for measurements of precipitation, evaporation, stream flow level, stream discharge, sediment transportation and ground water behaviour including consideration of the number of stations required and the desired length of the record.
61. This meeting is cited as an example which may be followed by groups of less developed countries in other parts of the world as an essential preliminary step towards efficient development and utilization of water resources. Indeed, such preliminary measures are long overdue.
62. In regions covered by United Nations Economic Commissions the collaboration of WMO with the Commission concerned could take place in the same way and more continuous arrangements might usefully be developed. For regions such as the Middle East or Africa, however, special means for undertaking a general effort would have to be devised.
63. The necessary steps might be envisaged as follows. First, within each broad region, areas presenting similar climatic and hydrologic problems would be delimited. Next the detailed questions requiring attention would be determined by means of a questionnaire circulated to the governments concerned. And lastly, a working party would be convened to make appropriate recommendations for integrated action to correct hydrologic data deficiencies in the area.
64. It would appear that the United Nations and WMO might jointly undertake the steps outlined - with the assistance, when appropriate, of international scientific organizations.

Integrated River Basin Development

65. Integrated river basin development has for some years been going on in many parts of the world, and, especially in under-developed countries, interest in such development has been growing rapidly. The time seems ripe for the taking stock of the experience gained in different countries, for the mutual

information of all concerned - not only water technicians but also administrators and economists.

66. Experience has shown that engineering and cost evaluation of river basin development are subject to a degree of uncertainty of which the administrative and policy-making bodies are not always fully aware. Moreover, some aspects of water engineering are still not completely mastered technically. Another difficulty lies in the sometimes stationary approach implied in engineering solutions which do not sufficiently take into account possible economic and population growth. The risk may be run then of either preventing the full development of an area especially its industrialization, or of requiring in future much heavier capital expenditure.

67. Economically, the difficulties of measuring benefit in relation to cost are well known. However, the experience regarding interest rate and capital cost per unit of water and power has varied so much that a synopsis of the results attained under various multi-purpose river schemes would be most useful in determining more accurately the appropriate total capital cost of future projects. Improvement of the economic analysis might be achieved also if an opportunity were provided for a comparison of the multiplier effect which a number of the projects completed to date had on various economic branches in their respective areas.

68. There are other problems - administrative, economic and social - inherent in integrated river basin development that require systematic review.

69. One such question is concerned with the kind of authority or authorities which should be responsible for the over-all development scheme. The answer will depend on the governmental structure - federal or centralized - prevailing in a given country. It will also depend upon the economic potentialities, the size of the proposed development scheme, and upon the existing resistance to the substitution of new for traditional methods of agricultural exploitation. The examination of accumulated experience could also throw light on the question of financial autonomy for the authorities - when it should be granted and to what degree.

70. Another aspect of the economics of river basin development is concerned with the effect upon the various regions of the basin - the mountainous areas,

the downstream areas or the plains. Study is required of the implications for the existing distribution of population between the mountains and the plains and, in the plains, between the market centres and the countryside. River basin development usually enhances the exploitation of the plains, leading to demographic imbalance between the plains and the mountainous areas and in the long run to the impairment of watershed management measures. It would be important to learn what kind of industrialization has proved best suited to downstream areas - best suited in the sense that it has served to initiate self-sustaining growth without impairing balance between town and village or countryside development. Similarly, the role played by demonstration zones for diversified activities, industrial or agricultural, would be of great interest to countries now planning similar schemes.

71. Finally, attention should be paid to the experience in local development schemes affecting tributaries of main rivers without awaiting the completion of the collection of the data required for the construction of large engineering works on the main river. The latter call for extensive geologic surveys, compilation of hydrologic data and various engineering studies requiring much time and capital. The execution, meanwhile, of small-scale engineering projects on the tributaries may serve not only to improve the economic and social conditions of local communities but to contribute to the general scheme. It helps to stabilize the water flow and allows a more widespread and systematic collection of the data needed to determine the practicability of various technical measures for the control, development and use of the water resources in the river basin as a whole.

72. An international conference could do much to provide an adequate opportunity for the examination and exchange, on a world basis, of the experience acquired to date in integrated river basin development, and in order also to attract the attention of governments, economists and administrators concerned to the importance of the problems involved, especially in under-developed countries.

73. The role of international conferences for the promotion of natural resource development was recognized by the United Nations at an early stage. After the United Nations Scientific Conference on the Conservation and Utilization of Resources held during the summer of 1949 at Lake Success, the Council adopted

a basic resolution on natural resources. "Recognizing the importance of promoting the effective and sustained use of the world's natural resources as a means of furthering economic development", the Council referred to "the progress that may be made in this direction through the holding of international conferences in which there is an exchange of information pertinent to particular types of resources".^{11/} The advisability of an international water conference was again put forward in the last report of the Secretary-General on water resource development.^{12/}

V. SUMMARY AND CONCLUSIONS

74. The present report has endeavoured to show the work done during the last two years by the United Nations both at headquarters and in the regional economic commissions as well as recent action taken by the specialized agencies in water resources utilization and development.

75. Reference has been made to the fact that periodic inter-agency meetings have constituted an important step towards closer co-operation among the United Nations organizations concerned with water problems. Much improvement, however, is still needed in the collection, analysis and dissemination of data on current development, without which no steady promotion of international activities can be achieved. The same applies to the need for closer co-ordination among activities concerned with technical assistance.

76. The urgent need for international action to remedy the deficiencies in hydrologic data has been pointed out. Much of the economic progress in the regions concerned may be delayed indefinitely if basic information is not collected and analysed. Indeed, not only is the deficiency in hydrologic data in a country a handicap in the development of its own resources, but it also adversely affects understanding of the hydrological conditions of the region as a whole. A main obstacle lies in the limited resources at the disposal of under-developed countries on the one hand and United Nations organizations on the other.

77. River basin development is now recognized as an essential feature of economic development and the report has briefly reviewed the problems involved

^{11/} Resolution 345 (XII).

^{12/} E/2603, paragraph 53.

in such schemes. Whatever the solutions adopted they have far-reaching consequences on the economic evolution of the countries concerned and they involve sustained capital expenditure. The undertaking of any over-all project is a complex matter involving not only technicians in a variety of fields but also those concerned with the administrative, economic and social implications. The possibility of convening a conference has been mentioned as one of the means which could be envisaged to bring together the engineer, the economist, the administrator, in short all people concerned with the various aspects of water resource development, so that they could compare experience in various parts of the world and provide some guidance to countries engaging in integrated river basin development projects.

78. Although significant progress has been made along the lines suggested in the interim report submitted by the Secretary-General to the eighteenth session of the Council,^{13/} it would be misleading to believe that, so far, the work done has been on the scale envisaged by the Council when it adopted the original resolution. This is due to the magnitude of the problems facing countries and those international organizations concerned. As for the latter the main reasons of their cautious approach have been as follows: (a) time was needed for a greater concentration of activity to determine priorities among the problems to be dealt with and to learn what Governments and organizations had already undertaken; (b) it has proved difficult to secure the services of highly qualified technicians to help the United Nations; and (c) it has not been possible for the Secretariat within the restricted budget of the United Nations during the last two years to make available the personnel necessary. The scope of the problems can now be better assessed and the areas in which international action is most promising can be envisaged. But any increase of activity by the United Nations towards a fuller implementation of the programme envisaged in resolution 417 (XIV) will depend upon the readiness of governments to release the water experts and the resources needed to enable the United Nations to carry out the systematic action which is called for.

APPENDIX

Technical Assistance Activities of the United Nations
Organizations in the Field of Water Resources

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Introduction

Technical assistance in respect of water resources is provided, upon request from Governments, by the United Nations TAA and by FAO, UNESCO, WHO and WMO. In addition, fellowships and scholarships are granted by these bodies to enable selected individuals in under-developed countries to study or observe abroad methods and developments in various water fields.

These technical assistance activities are summarized below under six broad headings. Under each heading, the projects are listed by region and by country. The items are not necessarily additive since certain projects affecting more than one branch of water resource utilization may appear under more than one heading.

This general summary, the first to have been presented in the field of water, has been compiled on the basis of information received from each of the agencies concerned.

I. Survey and Appraisal of Water Resources (including ground and surface waters)

LATIN AMERICA

Bolivia

An expert assigned from 1952 to 1954 made extensive surveys of the water resources of that country; made recommendations for implementation of hydroelectric projects and utilization of Lake Titicaca water for power and irrigation; made an evaluation of projects for immediate Government attention; and analysed the administrative set-up in Bolivia for water resources development (TAA)

Brazil

A specialist in terrestrial magnetism and mapping was sent to co-operate with the National Observatory and the United States Geodetic Survey in studying the most suitable location for a new magnetic observatory. Magnetic field work in Central Brazil was undertaken and personnel were trained in the use of magnetometers and in field techniques. (UNESCO)

Colombia

Survey and appraisal of surface and ground-water resources, Guajira Peninsula. (FAO)

Ecuador

One fellowship in 1954. (TAA)

Mexico

An expert in geophysics after a six-months' mission made detailed recommendations on the development of research with particular reference to the use of atmospheric knowledge in the solution of agricultural and hydrological problems. His successor, also a geophysicist, was joined by a hydrologist. (UNESCO)

EUROPE

Malta

Survey of surface and ground water reserves in connexion with FAO agricultural development survey mission. (FAO)

AFRICA

Tanganyika

Appraisal of the water resources of the Rufiji River Basin. (FAO)
(For Egypt and Libya: see Middle East)

MIDDLE EAST

Egypt

The Government in November 1952 requested a short-term mission of three outstanding specialists to assist the Desert Research Institute in developing its programme and facilities. Basic equipment and five fellowships were also requested. In 1953 a preliminary mission was carried out by a hydrologist and a hydrogeologist is at present at the Institute. (UNESCO)

One scholarship and one fellowship in 1952. (TAA)

Iran

In 1951 an expert located 50 wells through analysis of the Government's aerial photographs, and through ground study of the areas covered in the photographs and of areas in immediate need of water. (TAA)

Appraisal of water resources of several river basins by a team which includes hydrographers, hydraulic engineers and hydro-geologists. Appraisal of ground water resources of the Teheran basin. (FAO)

One fellowship in 1953. (TAA)

Iraq

Survey and appraisal of ground water resources, followed up by exploratory drilling. (FAO)

One fellowship in 1954. (TAA)

Israel

Run-off, rainfall studies as part of an appraisal of water resources. (FAO)

Two fellowships in 1953 and one in 1955. (TAA)

Jordan

Survey and appraisal of ground water resources. (FAO)

Libya

Reconnaissance survey of the water resources of the Wadi Megenin.

Survey of the water resources of the Fezzan. (FAO)

Saudi Arabia

Survey and appraisal of water resources of the Assir Tihamas. (FAO)

Syria

Survey and appraisal of water resources in various parts of the country. Followed up by exploratory drilling. (FAO)

Yemen

A general geologist sent in 1954 reported a favourable hydrological potential in his report on mineral and water resources. It is planned to assign a hydrologist to develop further the initial survey. (TAA)

Reconnaissance survey of water resources in connexion with the work of the FAO agricultural survey mission. (FAO)

FAR EAST

Afghanistan

A team began in 1952 a study to locate and appraise underground water resources. The project has led in 1955 to the establishment of a Geological Survey Department, including a Hydrological Section. (TAA)

Irrigation reconnaissance survey, Mukur. (FAO)

India

During 1953 two experts assisted the Central Water and Power Research Station at Poona. One organized and developed a research programme in the field of photoelasticity, and started advanced training with equipment provided by UNESCO. He returned in 1955 for a further year. (UNESCO)

Korea

Appraisal of the water resources as part of the work of an investigation team. (FAO/TAA)

Nepal

Water resources survey of the Katmandu Valley and other areas. (FAO)

Pakistan

Baluchistan States Union:

- Preliminary appraisal of water resources as part of the Kalat State development survey. (TAA/FAO)

- A project intended for investigation of hydroelectric potentialities broadened into hydrogeological mapping of a large area. The experts worked closely with a UNESCO geophysical team. (TAA)

- Ground and surface water carried out by a team of experts; included geological survey, geophysical work, exploratory drilling and hydrological studies. (FAO)

- Ground and surface water survey of the Pishin-Lora Basin. (FAO)

Resources survey and river development planning on the right bank tributaries of the Indus. (FAO)

Two fellowships in 1955. (TAA)

Philippines

One fellowship in 1952. (TAA)

II. Water Supplies (town, rural and industrial)

LATIN AMERICA

Ecuador

A request is being considered for experts in the distribution of drinking water for the Municipalities of Guayaquil and Manta. (TAA)

El Salvador

An expert in well-drilling to train local personnel in the use of equipment supplied under the TAA programme to improve water supplies in communities of the health demonstration area. (WHO)

Nicaragua

Reorganization and development of health services in rural areas, including the undertaking of water supply work. (WHO)

Panama

Improvement of rural health services, including the development of safe water supplies. (WHO)

EUROPE

Greece

Survey and advice on plans to provide water supplies to 48 villages in northern Greece. (WHO)

Yugoslavia

A consultant in environmental sanitation gave advice on the utilization and training of personnel, and on the question of water supplies. (WHO)

Assistance in the development of rural water supplies in Macedonia. (FAO)

MIDDLE EAST

Egypt

Demonstration of co-ordinated district health services, including training of personnel, with emphasis on the improvement of rural water supplies, in the Qalyub area. (WHO)

Two fellowships in 1953. (TAA)

Iran

A project in 1953/54 studied the water needs and supply problems of a number of towns. (TAA)

Jordan

Development of ground water resources for rural water supply. (FAO)

An expert is now advising the Government on overcoming a current water shortage in Amman, having been recalled by that Government after a year's project ending in 1954, in which he advised on water supply and sewage disposal and assisted in considerably increasing Amman's water supply. (TAA)

Sudan

Planning of rural water supplies for Darfur province. (FAO)

Surveys of rural water supply projects; surveys of underground water in Port Sudan and Kordofan Province. (FAO)

Syria

Development of rural water supplies in various provinces of Syria as a follow-up of the water resources survey. (FAO)

Turkey

Advice on general questions of public health administration, including the improvement of rural water supplies. (WHO)

FAR EAST

Burma

A sanitary engineer has been advising the Ministry of Housing on implementation of plans for extension of water-borne sewage in several cities;

this work has led to a broader study of expansion of urban water supply in a number of towns and cities. (TAA)

China (Taiwan)

Advice on organization, training and demonstration programmes relating to modern and economical water supply schemes. (WHO)

India

Development of ground-water supplies for irrigation and rural needs in Madras State. (FAO)

Two fellowships in 1955. (TAA)

Pakistan

In response to an urgent request in 1953 a geophysical team and a hydrologist were sent to Karachi to help deal with a critical shortage in water supplies. Important water sources near the city were discovered and wells developed, relieving the emergency pending the completion of long-range plans. (TAA)

In connexion with this project, an expert is also investigating methods of recharging underground supplies by diverting river flood waters into natural underground reservoirs. (TAA)

Organization and demonstration of measures to control cholera in the delta area of East Pakistan, with emphasis on the construction of safe rural water supplies. (WHO)

Development of rural water supplies and supplies for irrigation in the Quetta area as a follow-up of water resources survey. (FAO)

One fellowship in 1952. (TAA)

Thailand

An expert in well drilling is being recruited in connexion with the UNESCO/TAA community development project in Ubol. (TAA)

Establishment of a rural health centre at Chiangmai for improving general health, particularly environmental sanitation (including water supplies). (WHO)

III. Irrigation, Drainage and Reclamation

LATIN AMERICA

Haiti

One fellowship in 1954. (TAA)

Jamaica

Irrigation studies. (FAO)

Trinidad

Participation in the planning and design of reclamation projects in the marshy coastal area of the island. (FAO)

EUROPE

Yugoslavia

Participation in planning and design of irrigation and land reclamation projects in the Voivodina and the Neretva river in Dalmatia and in Macedonia. (FAO)

AFRICA

Gold Coast

Investigation of suitable methods of irrigation on the heavy soils of the coastal plains. (FAO)

Tanganyika

Participation in the over-all planning for the utilization of the Rufiji River (Flood control, drainage and irrigation). (FAO)

Design of small pilot irrigation and drainage projects in the same area. (FAO)

MIDDLE EAST

Iran

Comprehensive planning and design of selected irrigation projects covering 3,000 to 40,000 hectares (Khuzistan, Esfahan, Azerbeidjan, Teheran and Shiraz). The team included hydraulic engineers, hydrologists, soil specialist, drainage and farm management experts. (FAO)

Israel

Irrigation studies. (FAO)

One fellowship in 1953. (TAA)

Jordan

Geological investigation in connexion with the planned storage reservoir on the Yarmuk river. (FAO)

Saudi Arabia

Preliminary participation in the planning and design of an improved type of flood irrigation project near Jizan on the Red Sea coast (30,000 acres). (FAO)

Syria

Participation in the planning and design work of an irrigation and drainage system of the Ghab project. (FAO)

Yemen

Reconnaissance survey of pilot irrigation projects in the coastal area. (FAO)

FAR EAST

Afghanistan

Reconnaissance survey in the Mukur area for the appraisal of irrigation and drainage projects. (FAO)

Ceylon

Reconnaissance survey of marshy tidal land on the south west coast with a view to reclamation. (FAO)

India

One fellowship in 1953. (TAA)

Japan

Dam foundation investigation on an irrigation scheme. (FAO)

Korea

Survey of existing irrigation projects with a view to their development and improvement. (FAO)

Pakistan

Participation in the planning and design of the Ganges-Kobadak pump irrigation scheme. The team of experts consists of irrigation and hydraulic engineers, surveyors, soil experts, farm management experts and irrigation agronomists. The same team has also carried out a reconnaissance survey in another part of the Ganges-Kobadak area including its coastal tidal part. (FAO)

The use of pontoon pumps for irrigation purposes was studied for use in the Ganges delta. (FAO)

Indus Valley: possibilities of reclaiming saline and alkaline soils by means of lowering water table by pump drainage and by other related measures were studied in the Punjab and especially on the pilot scheme near Choharkhana. (FAO)

North West Frontier Province: Participation in the design of major earth dam near Bannu for irrigation purposes. (FAO)

Investigations of storage possibilities for irrigation on several other right bank tributaries of the Indus. (FAO)

Baluchistan: Several surveys of ground water irrigation and water spreading schemes were investigated and pilot schemes selected for implementation. (FAO)

One fellowship in 1952. (TAA)

IV. Soil and Water Conservation (Headwaters control
and watershed management)

LATIN AMERICA

Jamaica

Watershed management investigations and water and soil conservation surveys.
(FAO)

AFRICA

Tanganyika

Survey of headwater areas of the Rufiji basin and planning of headwater
reservoirs, as part of the Rufiji basin development survey. (FAO)

MIDDLE EAST

Egypt

One fellowship in 1954. (TAA)

Iran

Surveys of watersheds. Proposals for soil conservation methods in
irrigated areas. (FAO)

Iraq

Watershed studies in the north western part of the country. Planning and
design of a pilot scheme at Chamchamal. (FAO)

Israel

Studies and recommendations have been made by an expert on water storage,
utilization of difference in elevation between the Mediterranean and Dead Seas,
storage of flood waters, recharging of underground water supplies, and blanketing
of reservoirs to prevent leakage. (TAA)

Watershed management and soil conservation studies and planning work. (FAO)

Sudan

Planning and design of soil and water conservation measures in the central
savannah belt of the Sudan. (FAO)

FAR EAST

India

One fellowship in 1952 and another in 1954. (TAA)

V. Hydro Power Projects

LATIN AMERICA

Bolivia

One scholarship in 1954 and one fellowship in 1955. (TAA)

Brazil

One scholarship in 1952. (TAA)

Central America

In connexion with a serious electricity shortage, a team of three electric power experts have made a field survey of resources for over-all development of electric power for the region as a whole. Their report has been circulated to the Governments concerned, and a request for two experts in hydroelectric development for 1956 is being considered. (TAA)

Ecuador

An expert in 1953 studied the power resources and outlined a five-year plan for hydroelectric development; the same expert is now advising the Government on the establishment of a National Power Board. In addition, the Ecuadorian Irrigation Board has requested two experts, one to advise on organization of a Research Department to study power for use in irrigation, another to plan several irrigation projects. (TAA)

Two fellowships in 1955. (TAA)

Haiti

One scholarship in 1953 and another in 1953/54. (TAA)

Mexico

One scholarship in 1954. (TAA)

Paraguay

One fellowship in 1955. (TAA)

Peru

An expert has made a preliminary survey of present and future electric power needs in the Department of Cuzco; the survey includes recommendations for a hydroelectric power station site and data on plant and distribution system designs and costs. (TAA)

Uruguay

One fellowship in 1952. (TAA)

Venezuela

An expert has returned to serve on a long-term assignment advising the Government on implementation of plans for power development on the Caroni River Valley. (TAA)

EUROPE

Austria

One fellowship in 1953. (TAA)

Greece

One fellowship in 1952 and another in 1954. (TAA)

Yugoslavia

A total of seven experts since 1952 have advised the Government on various aspects of hydroelectric power production and transmission, from the gauging of streams (in co-operation with WMO) to specific civil engineering problems and the design and construction of hydraulic turbines. (TAA)

Two fellowships in 1952 and four fellowships in 1955. (TAA)

AFRICA

Liberia

One fellowship in 1952. (TAA)

MIDDLE EAST

Egypt

Two fellowships in 1952, one scholarship in 1952, and one fellowship in 1953. (TAA)

Iran

One fellowship in 1952, one scholarship in 1953 and one fellowship in 1955. (TAA)

Israel

One fellowship in 1953. (TAA)

Turkey

Four experts prepared for the Department of Water Surveys and Electric Power a study on several aspects of rural electrification in western Turkey; two of the experts are now preparing a similar report for eastern Turkey. (TAA)

FAR EAST

Ceylon

Two fellowships in 1955. (TAA)

China

One fellowship in 1954. (TAA)

India

One fellowship in 1952, one in 1953, two in 1954 and three in 1955. (TAA)

Japan

One fellowship in 1954. (TAA)

Korea

One fellowship in 1953. (TAA)

Laos

The candidacy of a topographic expert has been submitted to the Government to lead and train local personnel in a detailed survey of the site of a proposed hydroelectric project on the Nam Theun River. (TAA)

Nepal

One fellowship in 1953. (TAA)

Pakistan

In the Punjab an expert is assisting the Government in the planning, design, and construction of six hydroelectric projects; these will in turn provide power for the deep-well pumping necessary for the extensive irrigation projects contemplated for the area. (TAA)

Philippines

One fellowship in 1952 and another in 1953. (TAA)

Thailand

One fellowship in 1953 and one scholarship in 1955. (TAA)

VI. Multi-purpose Water Development

LATIN AMERICA

Brazil

Work is in progress in the Sao Francisco Valley to utilize the river for production of hydroelectric power and development of the semi-arid areas adjacent to it. Scientists for resource research in connexion with this project have been provided. (UNESCO)

Two geologists collaborate with an FAO mission and national research workers on the survey and development of the Amazon region. (UNESCO)

One fellowship in 1955. (TAA)

British Guiana

One fellowship in 1955. (TAA)

Ecuador

Following a joint UNESCO/ILO exploratory mission in 1950, a team of seven experts was sent to Ecuador. Among them was a hydraulic engineer. He prepared a project for the creation of a national institute of electricity and submitted a

report outlining a combined programme of agricultural, hydraulic and hydroelectrical development for the province of Chimborazo. He lectured on hydrology, advised on the setting up of hydraulic laboratories and prepared a plan of hydrological and meteorological equipment required for Ecuador.
(UNESCO)

Mexico

One fellowship in 1953. (TAA)

Uruguay

One fellowship in 1953 and another in 1955. (TAA)

EUROPE

Yugoslavia

One fellowship in 1955. (TAA)

MIDDLE EAST

Iran

A reconnaissance survey of Karkheh River. A preliminary survey of the Sefid Rud and the Kor Rud and the Karaj and Save. (FAO)

Iraq

One fellowship in 1952. (TAA)

Israel

One fellowship in 1954. (TAA)

FAR EAST

China

One fellowship in 1954. (TAA)

India

Participation in the Indian Government's Water Resources Training Centre at Roorkee University by provision of fellowships for study at the Centre by residents of the ECAFE region; and by provision of short-term lecturers at the Centre. (TAA)

A civil engineer is advising on dam design for the Bhakra-Nangal project designed to harness the River Sutlej for power and irrigation. One electrical and one mechanical engineer are also under appointment and will remain through 1956.
(TAA)

One fellowship in 1952. (TAA)

Indonesia

An expert on natural resources has just begun work on advising the Government in development of multi-purpose dam projects in Sumatra and West Java. Purpose of these projects is development of hydroelectric and irrigation facilities, and the subsequent establishment of power-consuming industries, especially aluminum.
(TAA)

Japan

One fellowship in 1954. (TAA)

Pakistan

Water development planning on the right bank tributaries of the Indus. Storage reservoirs, when built, will be used here for irrigation and for power. The same applies to the Baran Dam at Bannu, where incidental power gained on canal falls will be utilized. (FAO)

Philippines

One fellowship in 1952. (TAA)

VII. Establishment and Development of Meteorological and Hydrological Services

LATIN AMERICA

Dominican Republic

A mission composed of two meteorologists has been working since the beginning of 1954 to develop and reorganize its meteorological service and instruct suitably qualified students in the different branches of meteorology. A Hurricane Seminar will be held early in 1956 and will study among other things flood forecasting techniques. (WMO)

Haiti

One fellowship in 1954. (TAA)

Jamaica

Assistance in compiling basic data on rainfall and run-off has been provided by a hydrometeorological expert, as an outgrowth of the interest in flood control and valley development. (TAA)

Nicaragua

An expert began in 1955 to advise the Government on the organization of a national meteorological service, the establishment of a network of stations and the initial training of observing personnel. (WHO)

EUROPE

Greece

An expert is under recruitment for a 12-month assignment to serve as hydrological adviser to the Institute of Geology and Sub-soil Research under the jurisdiction of the Ministry of Co-ordination in Athens. (TAA)

The Meteorological Service of Greece is at present under reorganization and with this in view four fellowships have been granted in various fields of meteorology. (TWMO/TAA)

Yugoslavia

Technical assistance in both meteorology and hydrology. After a survey of the country, various experts were sent, one of them to survey the existing hydrologic services. (WMO)

Ten fellowships have been awarded, one of which was in organization, one in hydrology, one in stream flow and instruments, and one in water cadasters and statistics. (WMO/TAA)

AFRICA

East Africa

One fellowship in 1954. (TAA)

Southern Rhodesia

One fellowship in 1953. (TAA)

Tanganyika

Development of hydrological service with special emphasis on the Rufiji river basin. (FAO)

MIDDLE EAST

Iran

An expert was sent to assist the Government in co-ordinating the various existing meteorological services prior to the establishment of a National Meteorological Institute; it is intended to establish a climatological section capable of fulfilling the different requirements of agriculture, irrigation, water resources, etc. (WMO)

Participation in the establishment of hydrographic service on all main rivers of Iran grouped in river basins. (FAO)

Training of Iranian personnel. (FAO)

One fellowship in 1954. (TAA)

Israel

Two fellowships in 1953 and two in 1955. (TAA)

Jordan

An expert has been assigned since October 1953 for the purpose of developing the existing meteorological service and instructing forecasters and observers. (WMO)

A fellowship has been granted to a Jordani who may later assume the functions of Director of the Service, and another will probably be granted. (WMO/TAA)

Libya

Following a general survey of the country, two experts have been sent to Libya, one to organize a national meteorological service, and the other to train assistants. (WMO)

Saudi Arabia

Establishment of river gauging stations on some of the coastal wadis in the Tihamas. (FAO)

Syria

After an initial short mission, a follow-up mission has been sent to advise the Government on the organization of a national meteorological service. A School of Meteorology has also been set up and an instructor will be required. (WMO).

Two fellowships in synoptic meteorology and climatology have been granted. (WMO)

Four fellowships in 1955. (TAA)

Turkey

Two specialists in hydrogeology, one on geophysics and one in minerology have assisted the Government in the establishment of a central institute of hydrogeology. Courses have been conducted at the Technical University, Istanbul, and hydrological charts, based on field operations, have been prepared for a number of regions. (UNESCO)

Two fellowships in 1954. (TAA)

FAR EAST

Afghanistan

A two-man mission is being sent to organize the Royal Afghan Meteorological Institute recently set up. (WMO)

A fellowship will soon be granted to enable an Afghan meteorologist to study the organization of a meteorological service in a big and well organized meteorological service in a neighbouring country. (WMO/TAA)

Burma

One fellowship in 1955. (TAA)

China

The Taiwan Weather Bureau has been provided since the spring of 1954 with the services of an expert to develop the meteorological service, with special emphasis on warnings of droughts, floods and typhoons. The training tour of a

scholar throughout USA made him acquainted with general climatology, including precipitation measurements and statistics and irrigation farming, and enabled him to observe the techniques used in flood forecasting and water supply work. (WMO)

One scholarship in 1953, two in 1954, and one scholarship and one fellowship in 1955. (TAA)

Indonesia

One fellowship in 1955. (TAA)

Pakistan

Proposals for the establishment and development of meteorological and hydrological services in Baluchistan province. (FAO)

A geophysical team set up a research and training centre at Quetta. A second observatory was established at Chittagong. A new geodetic centre is being organized. (UNESCO)

Four fellowships in 1955. (TAA)

Four fellowships have been awarded to meteorologists, one of which is in the field of hydrometeorology. (WMO)

Philippines

A scholarship has been awarded to a meteorologist to enable him to study hydrology at the Imperial College of Science and Technology, University of London. (WMO/TAA)

Thailand

Four scholarships have been awarded to junior meteorologists to assist the development of the Meteorological Service; they will study in various fields of meteorology, including climatology and hydrology. (WMO/TAA)
