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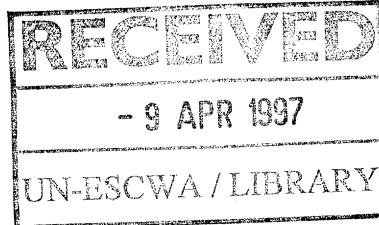
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Report of the ECWA
Regional Preparatory Meeting
for the
United Nations Water Conference

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INTRODUCTION

A. Attendance and organization of work

1. The ECWA Regional Preparatory Meeting for the United Nations Water Conference was held at Baghdad, Iraq from 11 - 16 December 1976.
2. The meeting was attended by representatives of the following Member States: Bahrain, Democratic Yemen, Iraq, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syrian Arab Republic and Yemen Arab Republic. The United Arab Emirates could not attend.
3. The Member States of the United Nations participated in the meeting as observers: Iran and the Union of Soviet Socialist Republics.
4. The Secretary General of the United Nations Water Conference (UNWC) and representatives of the Centre for Natural Resources, Energy and Transport (CNREMT) attended the meeting.
5. Representatives of the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP) attended the meeting.
6. Representatives of the following specialized agencies were present: the Food and Agriculture Organization of the United Nations (FAO), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the World Health Organization (WHO), and the World Meteorological Organization (WMO).
7. The following intergovernmental organizations were represented at the meeting: the Arab Fund for Economic and Social Development (AFESD), the League of Arab States and the Council of Arab Economic Unity (CAEU).

B. Election of officers

8. The meeting unanimously elected Mr. Afif Issa Khelaiwi (Iraq) as Chairman; Mr. Ibrahim Al-Sagabi (Saudi Arabia), and Mr. Muhsin Ali Al-Huraibi (Yemen Arab Republic) as Vice-Chairmen; and Mr. Mohamed Nouredine Rifai (Syrian Arab Republic) as Rapporteur for the meeting.

9. In accordance with rule 11 of the provisional rules of procedure, the officers of the secretariat examined the credentials of the delegations and found them in order.

10. A drafting committee comprising one member from each delegation was assigned the task of preparing the report comprising the finalized recommendations.

C. Inauguration of the meeting

11. The meeting was opened by Dr. Mukarram Jamal, Minister of Irrigation of Iraq, on behalf of the host Government. He expressed his government's concern with the question of water and its efficient utilization for agricultural and industrial purposes as well as for human, municipal and navigational uses. Considerable funds had been allocated to the development of water resources to ensure their full utilization, the preservation of their purity and their protection from pollution. In this connexion, the government had undertaken large projects for water storage and for the control and redistribution of destructive flood water for various purposes. The government had also given great attention to the improvement and regulation of irrigation and drainage schemes and made efforts to eliminate salinity in agricultural lands, following a policy of integrated reclamation through the completion of irrigation and drainage networks for the restoration of fertility to saline lands and the adoption of methods of intensive agriculture.

12. The Minister stated that, in regard to the protection of river waters from pollution, the Ministry of Irrigation was establishing numerous main outlets for the diversion of drainage water and went on to say that since the improvement and development of agriculture in Iraq was totally dependent on its water resources, especially those coming from outside, assurance should be given of its rights in resources shared with others. He called for the holding of negotiations with a view to reaching an agreement on the equitable allocation of water between neighbouring riparian countries and wished the conference success in achieving the practical and beneficial results to which it aspired.

13. In his speech, Dr. Mohammed Said Al-Attar, the Executive Secretary of the Economic Commission for Western Asia, expressed his deep gratitude and appreciation to the Government of the Republic of Iraq for hosting this conference and for the efforts they had exerted to ensure its success. He referred to the vital role played by water in the economic development of nations and the range of future water problems since the economic development of Member States is largely dependent on the wisely planned and efficient use of water resources. In most cases, governments of the region lack the legislative and administrative machinery, the hydrological data and the manpower resources needed for the exploration, evaluation, development and management of water resources. He went on to say that direct co-operation among the interested riparian countries was the only way in which the problems and potentialities of international river basin management and development could be identified and dealt with and that close co-operation between such countries was necessary to ensure the harmonization of long-term national plans, the optimum use of water resources, water quality control and the promotion wherever possible of joint plans for basin development. He expressed the hope that river basin agreements based on a mutual understanding of national and regional interests would help to maintain good neighbourly relations among basin states. In conclusion, he reiterated his gratitude and appreciation to the government and people of the Republic of Iraq for having arranged and hosted the meeting and wished it every success.

14. Mr. Yahia Abdel Mageed, Secretary General of the United Nations Water Conference, expressed his confidence, that, despite the seriousness of the water shortage in the region, a realistic solution to this problem could be found through a careful assessment of resources and their rational management and development in the light of modern science and technology. An exchange of world experience would also be facilitated by a series of special meetings. The action proposals made by the present meeting and the recommendations made by the working groups on agriculture, community water supplies and technical co-operation would constitute important inputs into the Argentina Conference. He referred to the recommendations made by other regional commissions on the need to formulate an overall national water

policy and the requirement for more complete hydrological data, training and research facilities, flood, drought and pollution control and regional co-operation to improve the efficiency of water use. He also drew attention to the importance of groundwater planning, economical methods of desalination and other non-conventional techniques for the production of water and commended the magnanimity of countries of the region in using their financial resources to foster the development of other countries in the Third World.

D. Agenda

15. The meeting adopted the amended agenda.
 1. Opening of the meeting.
 2. Election of Officers.
 3. Adoption of agenda and work plan.
 4. Country reports.
 5. Draft regional report.
 6. Arrangements for the United Nations Water Conference.
 7. Draft Water Resources Programme Budget 1978-1979.
 8. Any other business.
 9. Adoption of the report of the meeting.
 10. Closure of the meeting.

DISCUSSIONS

A. Country Reports
(Agenda item 4)

16. Delegates made short statements in which each gave a brief summary of his country report and an assessment of the water resources situation in his country. Most agreed that shortage in trained manpower, lack of national master plan, and inadequacy of current water legislation are major constraints. Need for more efficient use of water was also stressed.
17. ECWA secretariat will issue a supplementary report briefly summarizing the country reports and related statements made by delegates.
18. Brief statements were made by two international agencies and two regional organizations, summarizing their activities with particular reference to principal concerns of the United Nations Water Conference.

B. Draft Regional Report

(Agenda item 5)

19. The meeting had before it the draft ECWA regional report for the United Nations Water Conference. The secretariat informed the meeting that the action proposals contained therein would be put, after the adoption by the meeting, in the format used by the other regional commissions.
20. Following this, action proposals at the national, regional and international levels were discussed.
21. The proposals at the national level were discussed one by one, and were adopted with few amendments. However, a new proposal was introduced by the Syrian delegation, and three others by the Iraqi.
22. At the regional level, the ECWA secretariat's proposals were discussed, and after lengthy discussions and some amendments they were adopted.
23. At the international level, the ECWA secretariat's proposals were discussed and adopted. In addition, a new proposal from Iraq on establishing an international water commission under the Economic and Social Council was recommended. In this respect, the secretariat pointed out that the Economic and Social Council's standing Committee on Natural Resources covers what is envisaged and recommended by Iraq, but Iraq insisted on the establishment of an international commission for water only.

C. Arrangements for the United Nations Water Conference.

(Agenda item 6)

24. Mr. Yahia Abdel Mageed, Secretary General of the United Nations Water Conference, explained that preparations for the Argentina Conference were taking two forms:
 - i) Preparations made by the governments themselves during the course of regional meetings of which four had already been held and the fifth of which was now in session. The recommendations made during these four meetings had been consolidated into one document into which the action proposals, contained in ECWA's regional report, would be incorporated. Over 200 papers had been received from governments giving details of their experiences in water management,

the problems faced and the methods being adopted to overcome them. A general summary of the proposals made was being prepared for the reference of delegates.

ii) The main Conference documents on water resources and requirements, applications of technology, as well as present and future programmes, and policy options were being jointly prepared by various United Nations organizations and agencies.

25. A background document on water for agriculture had been prepared by FAO and a task force of government experts had been formed to review this document and prepare the action proposals to be taken into consideration to meet food targets. On 14 December another task force would meet in Geneva to review a document on "Community Water Supply" prepared by WHO and IBRD and dealing with problems of supplying adequate amounts of good quality water to the deprived two thirds of the world's population. Another task force had been set up to explore opportunities for co-operation in the field of water among developing countries. Details of this would be submitted for consideration to the Mar del Plata Conference. The Committee on Natural Resources would also meet in January to review this and other documents on policy options. The Committee would also approve the agenda and on-going action for the Conference which would be organized on the basis of three simultaneous meetings per day.

26. Mr. Abdel Mageed went on to say that a plenary and two committees would meet simultaneously to consider various issues. Governments should, therefore, form delegations accordingly and at high level. Funds had been provided by UNDP to enable some participants from developing countries to attend the Conference at Mar del Plata. Arabic would also be one of the official languages at the Conference. He also explained the close co-ordination in the preparations for the United Nations Water Conference and the United Nations Water Conference on Desertification.

D. Draft Water Resources Programme Budget 1978-1979.

(Agenda item 7)

27. The informal views of the meeting were sought on the Draft Water Resources Programme Budget for 1978-1979 which will be officially presented to ECOWA's session in April 1977.

E. Other business
(Agenda item 8)

27. None.

F. Adoption of the report of the meeting
(Agenda item 9)

28. The meeting adopted its report including ECWA's regional report for the United Nations Water Conference on 16 December 1976.

G. Closure of the meeting
(Agenda item 10)

29. At the closing session, the delegates, observers and members of the secretariat unanimously agreed to cable H.E. President Ahmad Hassan Al-Baker and Mr. Saddam Hussein, Vice Chairman of the Revolutionary Command Council, thanking them and the Iraqi Government for hosting the meeting and for the excellent arrangements made which contributed to the success of the meeting.

30. In his closing speech, the Chairman thanked the delegates, observers, members of the secretariat and interpreters for their contribution to the success of the meeting. Several delegates spoke thanking the Government of Iraq for hosting the meeting, and the secretariat of ECWA for preparing for this meeting and for the documentation and reports prepared for the meeting, which was an excellent opportunity for them to exchange views and experiences.

31. The representative of the secretariat reiterated his thanks to the Government of Iraq, to all those responsible for making the arrangements, and to the delegates and observers who made an effective contribution to the success of the meeting. He also thanked the interpreters for their efforts during the meeting.

32. On behalf of the Secretary General of the United Nations Water Conference, the representative of CNRET thanked the Government of Iraq for their hospitality and for the arrangements made to ensure the success of the meeting.

33. Finally, the deputy head of the Iraqi delegation commended the efforts made by the delegates, and observers and representatives of intergovernmental agencies and emphasized that it was through mutual co-operation that the meeting has achieved its goals. He also paid tribute to the members of the secretariat, the Secretary General of the United Nations Water Conference, United Nations Environment Programme and all the United Nations Specialized Agencies for their contribution towards the success of the Conference.

ANNEX

ECWA REGIONAL REPORT FOR THE
UNITED NATIONS WATER CONFERENCE

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GENERAL: PHYSICAL FEATURES AND METEOROLOGICAL CONDITIONS

The ECWA region consists of twelve Arab countries, occupying an area of some 3.7 million km². The region is bound from the south by the Indian Ocean, by the Arabian Gulf and Iran on the East, by the Mediterranean Sea and the Red Sea on the west and by Turkey on the north.

Except for the mountain range in northern Iraq and the Syrian and Lebanese heights, the ECWA region falls within the arid and semi-arid zone. It can, therefore, be typified by the Arabian Peninsula in as far as topography, climate, and to a certain extent, geology are concerned.

The most important factor defining the climate of the Arabian Peninsula is the low precipitation with rainfall averaging more than 100 mm/year in limited areas. Such averages have little meaning, however, since many areas receive no rainfall at all for many successive months and even years, and as such are classified as truly arid.

In general, the northern portion of the Arabian Peninsula is affected by Mediterranean winter precipitation, while in the south monsoon rains are important. Both areas are modified by local factors, in particular the relief and distance from the sea.

The effects of the south-west monsoon are variable, and it is not clear how far to the north they affect the Arabian Peninsula. On the east, it has been noted that in Qatar, rain falls more often in April. These late spring rains may be attributed to the monsoon effect. In central Saudi Arabia, the northern limits of such effects seem to vary from year to year. Precipitation varies from 50 - 600 mm with rainfall decreasing inland and then increasing a little again as the land slowly rises.

Agriculture in the region is based predominantly on dry land farming. Nevertheless, irrigation is still the largest water user. For the majority of crops, irrigation permits a higher and more stable level of output than would otherwise be possible. The majority of population in the region are living in rural areas and although urbanization is rapidly increasing, most of the population still work in agriculture.

From the geological point of view, the Arabian Peninsula consists of two major geological units. The Arabian Shield of basically pre-Cambrian crystalline rocks (Basement) from the almost straight eastern shores of the

Red Sea (2,000 kilometres) and the northern shore of the Arabian Sea (1,500 kilometres), and stretches inland for about 700 kilometres to form a great plateau (Najd) towards Riyadh, and to form a lesser plateau 300 kilometres wide in Yemen. The Arabian Shelf of sedimentary origin forms a cover of rocks ranging in age from Cambrian to Recent, overlying and dipping off the crystalline basement so that their thickness generally increases away from Basement outcrops; they have suffered little tectonic deformation or folding, until the very thick sediments far from the Basement are reached, as in the Jebel Akhdar mountain of Sultanate of Oman, which belongs to the Tertiary fold mountains, the Zagros and Taurus type.

I. RESOURCES AND NEEDS: ASSESSMENT OF THE WATER SITUATION

1. Data collection systems and their adequacy.

a. Meteorological networks:

Almost everywhere in the ECWA region there is a shortage of meteorological data. First class stations are usually in existence at airports, where recording instruments of rainfall, temperature, barometric pressure, wind direction and velocity are installed. In a few areas evaporation pans are in existence. Other than these airport stations, data consists of rainfall and/or temperature. The importance of rainfall stations in particular are being realized. Since rainfall and the resulting surface runoff are the principal sources for recharge of most wadi alluvium, rainfall amounts are being correlated against the total amount available in recharge. Some of the nations have as many as 60-80 meteorological stations, while others have fewer than 20, almost all nations, however, recognize the need for an adequate data gathering network and have placed high priority on programme for implementation of such networks.

b. Hydrological networks:

This is perhaps the most critically short item in data gathering. Some nations have no need for surface water measurements, while others have only a limited need. Bahrain, Kuwait and Qatar are examples of the 1st group. Most other nations, however, have an urgent need for hydrological stations and networks. Where rainfall is sufficient to produce measurable runoff a measure of such data is of importance. Many nations have installed stream gauging

stations on major wadis and have obtained a few years of record. Others are just installing their first such station and have yet to accumulate records. In several areas, analysis of recorded data is critically needed so that results can receive meaningful interpretation. In the northern nations of the Middle East where streams have year round flows, records are available for many years. Some of these streams are international and such data are needed in equitable sharing by riparian users. Generally, it can be said that there is an urgent need for additional hydrological data-gathering stations throughout the region. Closely associated with that need is the urgent need for interpretation, analysis and publishing of such data.

c. Hydrogeological networks:

Groundwater observation wells comprise the major portion of this network. Such data gathering can hardly be considered a network, however, since many groundwater observations are not recorded in a systematic way, many such observations are taken in local areas as a local means of determining the resources available for that year. Such records are not usually sent to a central storage point for summation or interpretation into national totals. However, many nations are realizing the importance of central data collection and are expected to devote more time and financing to this effort. In some areas entirely dependent upon groundwater as a source of supply, such as Bahrain, great attention is paid to collection of data from observation wells. Such wells are monitored and compared with previous years records to establish trends in depletion of the supply. Rainfall recharge relationships are being correlated in a few areas and hydrogeological data is proving to be the key to such evaluation. It is expected that networks for collection of such data will increase greatly in the next few years. Evaluation of such data must move forward accordingly.

d. Data use:

This is another area that is critically short in data gathering. Only a few nations in ECWA have good and reliable statistics available for past years. Usually where streams have year round flows, such as in Iraq and Syria, there are long standing records of municipal and agricultural usage because of the manner in which such supplies are obtained. Pumpage records can be easily maintained and other use records can be taken from gauges on the main streams themselves. However, where groundwater is the

principal source of supply, records are difficult to accumulate because of the number of wells and the difficulty in requiring every owner to keep records. Many private wells are drilled and supply industrial and commercial enterprises without any records being kept. As central piped distribution systems become more widespread, records of use can be more easily obtained and will be available in the future. Rural areas not dependent upon a central distribution system is the place where use data will be most difficult to obtain. Nevertheless, there is an awareness that use data are needed in most nations and it can be expected that more data will be obtained in the future.

2. Supply (Present)

a. Rainfall:

The MCWA region falls into the arid and semi-arid zones subject to local topographical conditions and distance from the sea. The Mediterranean influence and winter precipitation govern almost the northern half. The southern portion is hot during all seasons. It is influenced by the monsoonal effect and scant rainfall can be expected at any season.

The western corner of the Arabian Peninsula is characterized by a coastal plain and mountainous belt with elevations varying between 1000-2800 metres, moving eastward onto the Yemen highlands and the mountain of the Sultanate of Oman.

Rainfall amounts of less than 20 mm per year are experienced in the extremely arid areas. Amounts of up to 1500 mm per year are experienced in the higher elevations.

The rainfall in the Gulf area is affected by complex climatological conditions. There, the annual rainfall rarely exceeds 100 mm/year. It decreases towards the interior and increases a little as the land rises. The following table shows the annual mean precipitation of each country.

Table 1. Average Annual Precipitation in Western Asia

	mm
Bahrain ^{1/}	75
Iraq ^{2/}	
Desert Plateau	50-150
Lower Mesopotamia	100-200
Upper Plains and Foothills	300-500
Mountains	600-1000
Jordan ^{3/}	
West Highland	300-700
East Highland	300-600
Jordan Valley - Dead Sea	-
South Desert	below 250
East Desert	below 150
Kuwait ^{4/}	120
Lebanon ^{5/}	
Coast	800
Bekaa Valley	250-1500
Mountains	900-1500
Oman ^{6/}	40-180
Qatar (Doha) ^{7/}	60
Saudi Arabia ^{8/}	
North Region	80-120
North Eastern Region	50-70
Centre	85-110
Red Sea Coast	250
Mountains	400
Syria ^{9/}	
Coast and Mountains	500-1000
Other regions	50-500

/...

^{1/}, ^{3/}, ^{6/}, ^{7/}, ^{9/} : Country Report.

^{2/}, ^{4/} : National Science & Technology Policies in the Arab States, UNESCO, 1976.

^{5/} : "Etude des Eaux Souterraines", UN 1970.

^{8/} : Seven Green Spikes. The Ministry of Agriculture & Water. The Kingdom of Saudi Arabia, 1974.

Table 1. (Cont'd)

Average Annual Precipitation in Western Asia

	mm
United Arab Emirates ^{1/}	65
Yemen (YAR) ^{2/}	
Plains	200
Mountains	800
Yemen (PDRY) ^{3/}	
Mountains	above 400
Coast	above 50
North East	almost NIL

1/ : National Science & Technology Policies in the Arab States, UNESCO, 1976.

2/, 3/ : Country Report.

b. Surface:

Surface water supplies vary greatly in quantity and nature of flow throughout the twelve nations comprising the ECWA region.

Perennial stream flows in the region are limited to Iraq, Syria, Jordan, and Lebanon. The main rivers in the region are shown in Table 2.

Table 2. Main Rivers in the Region

Name of River & Country	Catchment Area (km ²)	Length (km)
Euphrates ^{1/} (Iraq)	177,000	1200
Euphrates (Syria)	76,000	675
^{2/} (Iraq)	253,000	
Tigris (Syria)		50
Jordan (Jordan)	6,000	N.A.
Litani (Lebanon)	2,168	170

1/, 2/ : Country Report of Iraq, Water Resources and Development in Iraq, Dr. N.A. Kadir, September 1973. Part of the catchment areas of both Euphrates and Tigris fall also inside Turkey and Iran.

N.A. Data not available

d. Other:

Although surface and groundwater form the main sources of supply for the twelve ECWA nations, desalination has come into prominence in recent years as a new source of supply. As noted in Table 5., quantities of desalinated water are appreciable and in many coastal areas is the principal source of supply. The convenience and abundance of energy in the form of petroleum and natural gas in many member states, has allowed joint development of flash distillation plants with electrical generation plants thus producing a fairly low cost for desalinated water. Usually such water is mixed with local brackish water, keeping the mixture within acceptable chemical standards, to form a new source of supply. Other desalination plants using the reverse osmosis process are fed with brackish waters, presently unfit for human or agricultural purposes, and waters of acceptable quality is produced. Costs of desalinated water reflect the economy of scale and such costs have been reduced drastically within recent years. It is expected that desalination will play an increasing part in meeting future needs.

The prospective supply of desalinated water in the region is as follows:

Table 5. Capacity of Desalination Plants in Operation and Under Construction^{1/} Mm³/y

	In operation	Under construction	Total
Bahrain	8.3	24.7 (1981)	33.0
Kuwait	102.9	66.4 (1980)	169.5
Oman	2.6	-	2.0
Qatar	10.4	18.6 (1977)	29.0
Saudi Arabia	17.8	128.8 (1980)	146.6
United Arab Emirates	2.0	N.A.	N.A.

In one or two countries, sewage effluent is now being used for agricultural purposes. This use is expected to increase in the future.

^{1/} : Country reports prepared either by governments or the ECWA secretariat.
N.A. = Data not available.

3. Demand (Present)

a. Municipal:

Municipal demand is increasing throughout the countries of the ECWA region. In recent years, central water distribution systems have been expanded and this has resulted in increased municipal water use. Many small villages and communities are also being connected to piped water systems with a resultant increase in demand. Per capita use rates have gone up as more homes are connected to piped water systems and more water using appliances are used. Meters are being installed in some areas to allow for water to be priced by quantity which in turn is expected to make water users more aware of water costs and thereby discourage waste. The country of Bahrain expects to have all municipal users on a metered basis within a few years. Municipal use is expected to continue to increase at a rapid rate as cities expand services to outlying areas. Much more use data are required to accurately assess present use of water for municipal purposes.

b. Rural domestic:

Rural domestic water demand is increasing rapidly throughout the ECWA region, with perhaps the most rapid expansion occurring in the petroleum producing countries. The non-petroleum producing countries are also placing a high priority on supplying water to rural areas for domestic consumption. The Yemen Arab Republic, for example, has set a high priority on supplying rural areas with piped water. In the United Arab Emirates, expansion is also occurring at a rapid rate, likewise in many other states. Usually the countries attempt to place stricter requirements upon sewage and waste disposal when piped water supplies are made available to rural areas. There is a need for more rural water treatment systems also, since the health of many more people can be influenced through piped water systems.

c. Industrial:

Few industrial demand figures are available for countries of the ECWA region. Usually industries are furnished with water through municipal systems, and records are not obtained for industrial use itself. Most of the industries are low-water users. The heavy-water using industries, such

as oil refineries, often have their own wells or their own source of supply and records have not been collected on an organized basis for such use. It is expected that as industrialization becomes more widespread there will be an effort made to systemize the collection of industrial use data.

d. Agricultural:

Water demand for agricultural purposes is increasing throughout the ECWA region. Irrigation is the largest user of water. Although records of such use are not complete, sufficient information is available to provide an overall appraisal of such use. Agricultural use data as shown in Table 6. were obtained whenever available. Some countries have just begun to compile such information on an organized basis. Because of the renewed interest in water demand and because of the critically short supply, it is expected that more attention will be given to use data collection. Many countries are moving to increased agricultural production in an attempt to become self-sufficient. This has caused an increased demand for water. This policy is expected to be examined because of the competing need for water is also continuing to affect this use considerably. More studies are needed to determine the economics of using water for agricultural purposes in those nations such as Bahrain, Qatar and the United Arab Emirates where agriculture has never played a major part in the economy of the country.

Table 6. Water Use in Agriculture

Country	Irrigated area ^{1/} (ha)	Water Use ^{2/} (Mcm/y)
Bahrain	3,700	166
Iraq	3,675,000 (1963)	39,530
Jordan	60,000	375
Kuwait	940	130 ^{3/}
Lebanon	80,000	647
Oman	36,000	420
Qatar	1,460	44 ^{4/}
Saudi Arabia	178,000 (1971)	13,500
Syria	619,000 (1972)	6,000
United Arab Emirates	4,000	331
Yemen (YAR)	580,000 (1971)	N.A.
Yemen (PDRY)	100,000	1,900

1/ : For Iraq, Jordan, Saudi Arabia, Syria and YAR - graded from Production Year-book, FAO, 1974, Vol. 28-1.

Others from the country reports prepared either by respective governments or the ECWA secretariat.

2/ : Country reports.

3/ : Including garden, household use and blending for distilled water.

4/ : Pumped amount.

N.A. = Data not available.

4. Trends in Supply and Demand of Water

a. Trends in supply:

The trend of supply in the twelve ECWA Member States is down in some areas and up in other. The known groundwater supply in general is decreasing. Water levels are dropping in many major aquifers. In Bahrain, for example, such decline amounts to several metres per year. Other nations

are also experiencing such depletions. Although this decline is occurring to the known aquifers, it is likely that there are untapped aquifers yet to be discovered or developed which may increase the total supply.

Surface water sources are increasing slightly as more development occurs to conserve and store water on streams and wadis. It is believed that the wadis offer the greatest potential for future development. Many more diversion dikes and water spreading dams are potentially available. It is expected that programmes of this nature will increase the supply.

Wastewater reuse is just coming into the picture as an additional source of supply, especially for agricultural purposes. Many cities are installing new sewage collection systems which will facilitate the use of wastewater use.

Desalination especially distillation, is a very important new source of supply and is especially beneficial along coastal areas where fresh water supplies are not available. The new source is expected to increase tremendously as new and better techniques are found.

b. Trends in demand:

Demand is definitely moving upward in the ECWA region for municipal and industrial uses. Rural domestic use is likewise increasing. Agricultural use is increasing in some countries but has stabilized in others. There should be a definite downward trend in irrigation usage as new and improved techniques for water management are put into effect. Canal linings, drip and sprinkler irrigation and new crops and cropping patterns are all expected to be seen within the next few years. In spite of this projected decrease in agricultural use however, it is expected that total demand will continue to rise because of the rapid expansion of municipal and industrial uses. Table 7. shows a summary of the resources and needs information for the ECWA region.

Table 7. Summary of Resources and Needs
Million m³

Country	Water Resources Potentials			Water Use			Future Water Demand				
	Surface	Ground ^{1/}	Present Future (Year of completion)	Agriculture	Domestic	Industry	Agriculture	Domestic	Industry	Year of projection	
Bahrain	Neg.	199	8.3	24.7(1981)	166	20	13	126 ^{2/}	41 ^{3/}	15	N.A.
Iraq	80,000	W.A.	N.A.	W.A.	39,530	580	2,240	52,100	3,520	11,960	(1995)
Jordan	850	165	N.A.	N.A.	375	4	6	465	60	30	(1990)
Kuwait	Neg.	130	102.9	66.4(1980)	130 ^{4/}	75	8	1,150	1,730	50	(1995)
Lebanon	3,800	50	N.A.	N.A.	647	94	10	3,180	600	600	(2000)
Oman	10	665	2.0	N.A.	420	10	10	N.A.	N.A.	N.A.	N.A.
Qatar	Neg.	50	10.4	18.6(1980)	44	6	6	55	20	20	(2000)
Saudi Arabia	2,200	1,723	17.8	123.8(1977)	13,500	830	150 ^{5/}	32,400	250	1,048	(1980)
Syria	32,000	1,600	-	-	6,000	400	N.A.	18,000	1,500	N.A.	(1990)
UAE	160-270	270	2.0	N.A.	331	31.3	31.3	409	42	42	(1990)
Yemen (YAF)	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Yemen (PIFY)	1,500	350	N.A.	N.A.	1,900	26	26	N.A.	N.A.	N.A.	N.A.

1/ Bahrain, UAE: safe yield. Oman: exploitable amount. Others: production.

2/ 1980.

3/ 1985.

4/ Including garden, household use and blending for distilled water.

Neg. Negligible.

N.A. Information not available.

II. THE PROMISE OF TECHNOLOGY: POTENTIAL AND LIMITATIONS

It can be safely stated that even in the least developed Member States of ECWA, few labour-intensive methods are in practice - mainly in the agricultural sector using imported labour.

In the field of surface water, considerable progress has been made in flood control and dam construction, and more is expected. Harnessing of runoff in desert areas and control of rivers overflows are still priority projects in the region.

Plans for comprehensive meteorological network, gauging stations, and rain gauging systems (including automatic recorders) are either underway or are being seriously considered.

Desalination of sea water (mainly by distillation) has been a major source of water supply in the region for the past two decades. More distillation facilities are under construction or in the planning stages. Capacities are sometimes as high as 50 million gallons per day per plant.

Other non-conventional techniques and processes such as saline water freezing, ion exchange, ultra-filtration, reverse osmosis, dialysis, and electrodialysis either have been tried or are being contemplated as alternates to distillation.

Considerable progress has also been achieved in utilizing groundwater resources. Simulation models, to forecast aquifers productivities, and modern drilling rigs have been in use in parts of the region for sometime. Other advanced technology such as remote sensing, and radioactive isotopes are also being slowly adopted, and may be widely used in the not too distant future.

Water reuse, though is currently being practiced in irrigation, has not really gathered momentum yet. There is little likelihood that it will be accepted in other sectors especially domestic use. Present technologies of water purification, however, are capable of producing high quality water from industrial and municipal effluents.

Groundwater recharge is being applied on a limited scale. But the potential is vast in this area. Besides replenishing the dwindling supplies of aquifers, artificial recharge may soon be used to prevent or retard the intrusion of salt water into underground aquifers. Even recharge with desalinated water is being considered.

Currently, all Member States of ECWA are suffering from the lack of adequately trained personnel in the field of water resources development. However, there is a strong trend among all countries of the region to bridge this gap as soon as possible.

Another area witnessing much concern in the region is the development of adequate water distribution systems and networks. It is expected that in the near future, the number of homes served by piped water will multiply several folds.

It should be pointed out that technological advances are not necessarily a prerequisite to the development of water resources within a state, especially in developing countries. There could be severe water shortages in a country despite its ability to have at its disposal the most up-to-date water resources development means. What is needed, first and foremost, is careful planning and wise judgement. Much may be achieved by adopting low-cost, labour-intensive approach that relies heavily on local materials and fits with local values and traditions. Reliance on technologies that are expensive, difficult to maintain and operate and ignoring local needs and conditions are not expected to have a smooth sailing.

III. POLICY OPTIONS

1. National Water Policies:

Unless there is a definite national policy regarding water, the exploration, utilization and conservation of this important natural resource will be retarded, misdirected and wasteful. The water policy may vary according to the existing situation and factors prevailing in the different countries. The purpose of a water policy is to ensure the most beneficial and optimum use and conservation of available waters taking as a base available water supplies and future needs.

Most of the countries of the ECWA region do not often have clearly defined water policies. Present policies are deficient in identifying goals, problems and solutions and in evaluating alternative course of action. They have partisan or fragmentary approach and multiplicity of organizations that deal with water without sufficient cognizance of each others' efforts. Co-ordination is often not sufficient. There is no order of priority nor is there a matching of supply and demand in terms of quantity, quality and/or location.

2. Water Legislation

Water legislation in general is the means through which it is possible to effectively implement and enforce any desired water policy. However, legislation by itself, does not constitute the only means for solving problems. In turn, it may be influenced by the legal systems followed and must take into consideration the sociological, religious and traditional character of the people of any particular country or region.

The purpose of water legislation is to ensure the rational use management and conservation of such resource in order to satisfy present and future demands. This may be achieved by bringing under unified co-ordinated or centralized administrative control existing and future uses of water.

A serious problem in the ECWA region is that the traditional legal rights of individuals, states and other entities are often stumbling blocks to water resources development and sufficient use. Farmers usually insist on their share of water whether required or not. Ancient customs and traditions are so deeply rooted in the lives of water users that far from being historical vestiges, these conventions are still operative and effective.

However, in some countries comprehensive legislation has been enacted, setting up water authorities with broad powers in water use, control and development. In Jordan for instance, the Natural Resources Authority was created in 1968. Broad powers under the legislation cover responsibility of planning, designing, construction, operating and maintaining water supply and irrigation projects. This authority is empowered to control the construction of private and public wells and to assist villages and communities in provision of water supply services to inhabitants and to dispose of wastes, polluted water and flood waters.

Special laws have been enacted in other countries covering only one or two phases of water use and development. One such country (Bahrain) requires drilling permits but has little or no legislation governing water use. Other countries permit well drilling without legal constraints of any sort. Guidelines having legal foundations are found in some countries covering drinking water and waste disposal. Generally, however, the countries of Western Asia have great need for legislation governing use and control of water.

Changing pattern of water use and increasing scarcity of water imply a need for water laws that will place maximum flexibility in the hands of water administrators consistent with necessary protection for water users. Opportunities to improve all systems of water laws in this respect should not be overlooked. Countries in a position to make major revisions of water law systems should make every effort to frame these laws so as to facilitate the reconciliation of disputes, comprehensively to control all water uses and resources and to provide for flexibility in coping with future water needs. While the water laws of other countries may provide useful guidance, each country has its own particular problems and must frame its water laws accordingly.

A basic water code or act could include provisions with respect to the following items: Ownership of water; right to use water; water conservation; water right administration and water authorities; water rates and charges; water quality, pollution control, health preservation etc. With respect to groundwater legislation, some specific legal measures are required in addition to what was stated earlier such as: licensing of drillers, exploration or prospecting licences, utilization or abstraction licence, permits, and metering of abstraction.

3. Institutions

Institutions having responsibility for investigation, development and management of water resources differ widely in the ECWA region. There is a wide variety of institutions in the different countries dealing with the various aspects of planning, development and management of surface as well as groundwater resources.

At the national level some countries have separate ministries for water resources development charged with the responsibility of overall policy making and programming and in many countries fully fledged departments of water resources development are included in ministries of agriculture or irrigation which formulate and implement projects.

In many countries, desalinated water is administered through department of electricity and water, because of the dual installations for these purposes. Generally, there is no single authority overseeing all water-related matters.

The Sultanate of Oman has recently established a Water Resources Council for the purpose of co-ordinating all water-related matters at ministerial level. To date, however, this Council is not functional.

As mentioned, Jordan has an operating Central Authority. In one or two countries environmentally oriented institutions were in existence, but at this time environmental matters are not receiving institutional attention. As a rule, sanitation and health matters are taken care of in the same institutional organization that has responsibility for drinking water.

4. Evaluation of Institutional Activity

Since the twelve countries in the ECWA region do not in most cases have a central authority over water-related matters, there is lack of co-ordination in many countries. Perhaps the single most important deficiency is lack of adequate data collection networks to assess the total water resources of the countries. Each functional department now obtains data primarily for its own use and there is little co-ordinated effort to obtain sufficient information to adequately assess the resources of the entire country. Most countries feel the need for a central organization not only to centralize data collection and assessment but to co-ordinate drilling activities and other water developments. Rural water systems quite often require co-ordination with irrigation and flood control activities, which is not always provided for by present institutions.

5. Environmental and Health Considerations

Environmental considerations are not manifest in many water-related programmes in Western Asia. Because of the small population of natural wildlife not much significance has been given to this phase of environment. To a certain extent, wildlife areas are maintained and encouraged. But largely environmental consideration pertains to human health matters. In many areas of the ECWA region it is being recognized that sanitary disposal of waste products has a direct bearing on community health. In rural areas where piped water is being introduced for the first time, requirements for sewage disposal are made at the same time. This is especially true where water supplies are taken from valley alluvium and danger from sewage pollution is great unless sanitary disposal methods are employed.

One area not receiving sufficient attention in so far as environmental consideration is the marine and coastal areas. High contamination of coastal waters is allowed to develop from upstream and on-shore developments without regard to marine and coastal environmental requirements. The environment as one of the multi-objective of planning is just beginning to be recognized.

6. Major Policy Issues

a. Scarcity of Capital:

Scarcity of capital as a policy issue is more noticeable in the developing countries of Yemen Arab Republic and Peoples Democratic Republic of Yemen. In these countries budget requirements for all purposes must stand scrutiny insofar as priority of need is concerned. Water resource development have been in large part financed by outside programmes and grants. The official government policy is beginning to recognize the urgency of financing drinking water projects from a meagre budget. Elsewhere in Western Asia, particularly in the oil-developing countries, water resource financing is not so much a constraint. In such countries priority is set by budgetary proof that there is a need for such financing. It is usually forthcoming if properly budgeted.

b. Scarcity of Trained Manpower:

This is a major constraint even in the oil-producing countries. The jobs in the petroleum industry drain off qualified manpower and leave a real shortage in water-related fields. There is an acute need for trained manpower throughout the Middle East and this is being felt in all areas, including the field of water resources.

c. Water Use Regulations:

Because of the lack of water use legislation in most countries, there is a minimum of water use regulations in effect. What regulations are being applied, are usually locally oriented and are based upon custom rather than law. Water being in short supply almost everywhere has caused over the years a system of regulations handed down from past generations. As a policy instrument water use regulations could go a long way toward solving some of the water problems prevalent today. It seems that self imposed regulations

- c) To this end it is recommended that countries should:
 - i) Ensure that national water policy is conceived and carried out within the framework of national and economic development policy.
 - ii) Develop water resources of each nation in such a manner that the standard of living of all people can be raised.
 - iii) Adopt measures for the conservation, maintenance and management of water basins with a view to ensuring the preservation of the natural resources therein.
 - iv) Develop capability of artificial recharge for groundwater basins wherever possible.
 - v) Use of cost-benefit analysis whenever possible to establish feasibility and priority for water resource development.

3.2 INSTITUTIONAL ARRANGEMENTS

3.2.1. NATIONAL WATER COMMITTEES

- a) In most of the Member Countries of the ECWA region, there are no national committees for water resources to deal on behalf of the country with the different international organizations and programmes and to which the latter can, in turn, address themselves.
- b) IT IS RECOMMENDED THAT COUNTRIES WHICH HAVE NOT YET ESTABLISHED NATIONAL WATER COMMITTEES DO SO AS SOON AS POSSIBLE IN ORDER TO CO-ORDINATE THE NATIONAL ACTIVITIES WITH THE DIFFERENT INTERNATIONAL PROGRAMMES AND COMMITTEES.
- c) To this end, the following points should be considered:
 - i) The specialized requirements for participation in international committees and programmes dictates that certain specialities be represented.

- ii) It is important to follow up the recommendations and the activities of these international programmes and organizations, such as the International Hydrological Programme, the United Nations Water Conference, the International Commission on Irrigation and Drainage and the International Commission on Large Dams for the benefit of the countries concerned.

3.2.2. CENTRAL WATER AUTHORITIES

- a) In most of the Member States of the ECWA region, water resources activities and responsibilities are divided between numerous agencies without adequate co-ordination and without adequate links to other aspects of national planning.
- b) IT IS RECOMMENDED THAT COUNTRIES FROM CENTRAL WATER AUTHORITIES, WHERE THEY HAVE NOT ALREADY DONE SO, TO PROVIDE FOR CO-ORDINATION OF ALL WATER-RELATED MATTERS AT A HIGH LEVEL.
- c) To this end it is recommended that countries should:
 - i) Review the existing allocation of responsibilities to ensure that:
 - a - Planning for water resources development is integrated with other facets of national planning.
 - b - Institutional and administrative arrangements are adequate to implement national policies rapidly and effectively.

3.3 MEASUREMENT AND PROJECTIONS OF WATER DEMAND

- a) In many countries no systematic measures are being made for planning purposes. Projections for future water demands are essential for long term planning but the absence of measurement data has made it difficult to estimate future requirements. In order to project future water needs it is desirable to have data on use and consumption.
- b) IT IS RECOMMENDED THAT STUDIES AND PRACTICES TO EVALUATE PRESENT AND FUTURE WATER REQUIREMENT IN THE LIGHT OF PROJECTED POPULATION, INDUSTRY AND AGRICULTURAL GROWTH BE MADE.

- c) To this end the countries should:
 - i) Initiate action to estimate the demand for different purposes.
 - ii) Ensure that statistics on use and consumption of water be compiled and organized.
 - iii) Endeavour, as far as is practicable, to adopt the forms and methodologies recommended by the United Nations in making such demand projections.

3.4. LEGISLATION

- a) Legislation in many countries is often complex and lags behind modern water management practices and techniques. Provisions which regulate water management are often contained in different laws and regulations. This makes it difficult to know and apply them.
- b) EACH COUNTRY SHOULD ENACT, WHERE APPROPRIATE, LEGISLATION TO REGULATE USE, CONTROL AND DEVELOPMENT OF THE NATION'S WATER RESOURCES.
- c) To this end it is recommended that:
 - i) make an inventory and critical examination of rules, (written or unwritten) regulations, decrees, ordinance and legislative measures in the area of water resources development;
 - ii) review existing legislation in order to improve and streamline its scope to include aspects pertaining to water development, protection of quality, prevention of pollution ... etc;
 - iii) consider the enactment of suitable legislation as needed. Although legislation should generally be comprehensive, it ought to be framed in the simplest way possible consistent with the need to spell out the respective responsibilities and powers of governmental agencies and the means of conferring rights to use water to individuals.

3.5 PUBLIC PARTICIPATION

- a) More efficient use of water, the elimination of waste and maintenance of quality depends to a great extent on the education of all types of water users to achieve better practices.
- b) PUBLIC AWARENESS AND INVOLVEMENT IN PROPER USE AND CONSERVATION OF WATER IS NEEDED IN MOST NATIONS OF THE REGION. NEWSPAPERS, RADIO, T.V. AND SEMINARS SHOULD BE USED FOR THIS PURPOSE WHENEVER POSSIBLE.
- c) To this end it is recommended that countries should:
 - i) Apply deliberate administrative policies to emphasize the value and scarcity of water such as measuring supplies, charging for water, penalizing wasteful and pollutive acts;
 - ii) promote agriculture extension programmes to enhance land and water management practices;
 - iii) public awareness should be increased through mass media (Newspapers, Radio, and T.V.) and seminars should be held for this purpose whenever possible.

3.6 DEVELOPMENT OF APPROPRIATE TECHNOLOGY

- a) In many developing countries, efforts are being made to hasten and develop local and appropriate technologies.
- b) SUMMARIZE FINDINGS OF ALL CONSULTANT REPORTS AND DISSEMINATE TO ALL WATER-RELATED AGENCIES WITHIN EACH COUNTRY.
- c) In this context, the following should apply:
 - i) review all consultant reports to determine interest that other water using agencies might have;
 - ii) disseminate findings in consultant reports to interested agencies;
 - iii) this would allow future studies and programmes to continue on a co-ordinated basis so that priority may be established.

3.7 JOINT VENTURES IN WATER MANAGEMENT AND DEVELOPMENT

- a) Some nations lack financial resources to adequately develop and manage their land and water resources.
- b) NATIONS WITH ABUNDANT FINANCIAL RESOURCES MAY HAVE JOINT VENTURES IN THE FIELD OF WATER MANAGEMENT AND DEVELOPMENT WITH LESS AFFLUENT COUNTRIES WHO HAVE ABUNDANT LAND AND WATER RESOURCES. THIS MAY BE DONE ON A COUNTRY-BY-COUNTRY BASIS, BUT PREFERABLY SHOULD BE HANDLED ON A COMBINED REGIONAL BASIS AS INCLUDED UNDER REGIONAL RECOMMENDATIONS.
- c) To that end it is recommended:
 - i) less affluent countries develop an inventory of investment needs in the field of water resources;
 - ii) determine the priority of such needs and seek aid from outside sources.

IV. EDUCATION, TRAINING AND RESEARCH

4.1 EDUCATION AND TRAINING

- a) Most countries of the region share problems in education and training both at technical and professional levels. However, the most serious shortage occurs in the field of technical training.
- b) MAXIMUM ADVANTAGE SHOULD BE TAKEN BY EACH COUNTRY OF AVAILABLE TECHNICAL STAFF IN WATER RESOURCES FIELDS BY MEANS OF ON-THE-JOB AS WELL AS FULL TIME TRAINING, VOCATIONAL TRAINING AND EXCHANGE OF TECHNICIANS BETWEEN COUNTRIES. EXPANSION OF UNIVERSITY PROGRAMMES AND THE AWARD OF SCHOLARSHIPS AT HOME AND ABROAD FOR PROFESSIONAL LEVEL TRAINING.
- c) In this context, the following considerations are pertinent:
 - i) education and training are necessary at all levels of technical and professional staff;
 - ii) programmes should provide for refresher and on-the-job training for existing staff to disseminate new developments in methods and techniques;

4.2 RESEARCH NEEDS

- a) Properly planned research is indispensable to the resolution of water problems. Such research is needed to reduce water demand as well as a search for new sources of water.
- b) THERE IS A NEED FOR STUDIES TO REDUCE WATER DEMAND, ESPECIALLY IN THE FIELD OF AGRICULTURE. DEVELOPMENT OF LOW WATER USING AND SALT TOLERANT CROPS IS NEEDED. THERE IS ALSO A NEED FOR STUDIES AND RESEARCH ON NEW WATER SOURCES, SUCH AS WATER DESALINATION, ARTIFICIALLY INDUCED RAINFALL AND THE RECYCLING OF WATER.
- c) To this end it is recommended that countries should:
 - i) strengthen existing and establish new institutions for the purpose of conducting water resources research;
 - ii) adopt and utilize the results of such research to assist in producing low water using crops;
 - iii) exchange information gathered from such research with other countries.

V. WATER USE AND EFFICIENCY

5.1. INSTRUMENTS TO IMPROVE THE EFFICIENCY OF WATER USE

- a) In many countries of Western Asia water is wasted or used in excess of actual needs. Often water is not used efficiently for agricultural, municipal and industrial purposes.
- b) DEVELOP MANAGEMENT PRACTICES TO IMPROVE THE EFFICIENCY OF WATER USE FOR MUNICIPAL, INDUSTRIAL AND AGRICULTURAL PURPOSES. THIS WOULD INCLUDE REUSE OF WASTE WATER AND POSSIBLY DUAL WATER SYSTEMS FOR DRINKING AND OTHER USES.
- c) To this end it is recommended that governments should:
 - i) create incentives for increasing efficiency of municipal use such as metering, appropriate scales of charges, and proper maintenance of piping networks to avoid losses;

- ii) take measures to encourage the use in industrial activities of technologies which consume little water or which reuse it;
- iii) discourage inefficient use of agricultural water due to losses in transit, unsuitable irrigation systems or lack of institutional co-ordination.

5.2 EFFICIENCY IN DISTRIBUTION AND REGULATION

- a) There is a special need for efficient protection of groundwater basins from uneven or overdraft in local areas to the detriment of the entire aquifer.
- b) MEASURES SHOULD BE TAKEN TO UTILIZE THE INTERNAL GROUNDWATER AQUIFERS IN THE FORM OF COLLECTIVE SYSTEMS, OR INTEGRATED SYSTEMS, SIMILAR TO SURFACE WATER IRRIGATION SYSTEMS WHENEVER POSSIBLE AND USEFUL. THIS IS TO GIVE THE WATER AUTHORITIES THE OPPORTUNITY TO EXPLOIT THE GROUNDWATER AQUIFERS FOR THE WHOLE EXTENT OF THE ACTUAL PHYSICAL LIMITS AND TO PROTECT THE SPRINGS AND THE GROUNDWATER FROM OVERDRAFT AND SALINITY AND TO ENSURE AN EQUITABLE SHARING OF THE RESOURCE.
- c) To that end it is necessary to:
 - i) carry out studies to determine the potential of the groundwater basin;
 - ii) develop legislation or rules and regulations to govern the situation so that there can be an orderly development of the resources.

5.5 COMMUNITY WATER SUPPLY

- a) A large portion of the world's population does not have reasonable access to safe water supplies. The provision of inexpensive and plentiful water supply to all communities and villages is urgently needed.

- b) ECONOMIC AND EFFICIENT METHODS ARE NEEDED FOR SUPPLYING WATER TO ALL COMMUNITIES INCLUDING REMOTE VILLAGES. A CONCERNED EFFORT SHOULD BE MADE TO PROVIDE SAFE WATER ON THE BASIS OF TIME TABLES SET UP IN EACH COUNTRY. ADDITIONAL WELL DRILLING CAPABILITY IS ALSO NEEDED IN MANY COUNTRIES.
- c) To this end it is recommended that countries should:
 - i) ensure that the allocation of funds and other resources to community water supply reflects the urgency of the needs;
 - ii) prepare long range plans and specific projects to fit the time table of development;
 - iii) carry out community water supply programmes as national undertakings where local funds do not enable the goals to be reached;
 - iv) adopt policies which would allow mobilization and use of local labour in the construction, operation and maintenance of local water supply projects, including well drilling activities.

VI. ENVIRONMENTAL, HEALTH AND NATURAL HAZARDS

6.3 FLOOD AND DROUGHT LOSS MANAGEMENT

- a) There are many areas of the world where severe hydrometeorological phenomena occur and cause great damage, leading to loss of life. Further, droughts of exceptional severity cause major hardships in many areas of the world. In order to remedy the situation water resources development and management should be considered the key.
- b) PROGRAMMES FOR FLOOD CONTROL SHOULD BE COMBINED WITH OTHER CONSERVATION MEASURES IN ORDER TO MINIMIZE DAMAGES FROM BOTH FLOODS AND DROUGHTS.
- c) To that end it is recommended that:
 - i) set aside a portion of the costs within the water budget for development of projects which will improve catchment areas for the retention of flood waters;

ii) promote the use of local participation in development of such measures;

iii) set up target schedules for the implementation of programmes.

B. ACTION PROPOSALS AT THE REGIONAL LEVEL

VII. REGIONAL CO-OPERATION

7.4 SPECIFIC REGIONAL RECOMMENDATIONS FOR WESTERN ASIA

- a) Because of the extreme importance of water resources to the future of Western Asia, it is imperative that measures be taken now to conserve and develop this vital resource in the most efficient and economic manner for the highest and best use of all the nations.
- b) THAT THERE BE FORMED A WATER RESOURCES COUNCIL FOR WESTERN ASIA (HEREINAFTER REFERRED TO AS THE COUNCIL), COMPOSED OF ONE REPRESENTATIVE FROM EACH OF THE FOLLOWING TWELVE NATIONS: BAHRAIN, IRAQ, JORDAN, KUWAIT, LEBANON, OMAN, PEOPLES DEMOCRATIC REPUBLIC OF YEMEN, QATAR, SAUDI ARABIA, SYRIA, UNITED ARAB EMIRATES AND THE YEMEN ARAB REPUBLIC; THAT EACH REPRESENTATIVE ON THE COUNCIL BE QUALIFIED TO SPEAK FOR HIS COUNTRY ON WATER-RELATED MATTERS; THAT SUCH REPRESENTATIVE BE NAMED AS SOON AS POSSIBLE IN ORDER THAT AN INITIAL MEETING BE HELD SOON THEREAFTER; THAT IN ORDER TO IMPLEMENT THE PROGRAMME OF THE COUNCIL CERTAIN COMMITTEES, TASK FORCES AND BOARDS, FOR EXAMPLE, AS NOTED BELOW MAY NEED TO BE ESTABLISHED ON A PERMANENT OR TEMPORARY BASIS; THAT SUCH COMMITTEES, TASK FORCES AND BOARDS MAINTAIN FULL CO-ORDINATION WITH UNITED NATIONS AGENCIES AND GOVERNMENTAL AND PRIVATE AGENCIES NOW WORKING IN WATER PROGRAMMES; THAT TASK FORCES BE PHASED OUT AFTER COMPLETION OF MISSION; THAT TASK FORCES, BOARDS AND COMMITTEES BE ESTABLISHED INITIALLY FOR THE FOLLOWING AREAS, WITH OTHERS TO BE FORMED AS NEEDED:

A. Board for Water Resources

This Board is for the purpose of establishing a new fund or to establish access to existing funds to be used in the form of loans or grants to the member nations of ECWA, at the national, regional and subregional (more than one country) levels in water-related programmes. The Board could establish an appropriate organizational structure to handle such funds. It could also be the responsibility of the Board, with approval of the Council, to disburse aid or to assist nations in securing funds for use in efficient and worthwhile water-related programmes. Such programmes could include, but need not be limited to, the broad categories of education, manpower training, research, consultant services, implementation of data collection systems, water resource development and management and economic analyses of water priorities. Specialists may be employed to determine eligibilities of need for assistance from the fund. Upon acceptance of this concept and formation of the Board, detailed procedures will be developed.

B. Task Force for Establishment of the Water Resources Technical Training Centre.

This Task Force could establish as soon as possible a training centre (with location to be determined by the Task Force and approved by the Council) for training of technical personnel urgently needed in the field of water resources. The initial size of training centre could allow for a minimum of 10 to 15 representatives from each country, with length of training period to be determined after detailed analysis. Training of subprofessional and technical level could be given in many water resource fields, including but not limited to the following:

- (1) Training in proper techniques of installation of data networks and the evaluation and assessment of such data.

The networks would include climatological stations, stream gauging stations, groundwater observations, etc.

(2) Fundamentals and principles of hydrology and hydrogeology at subprofessional level.

(3) Operation and maintenance of water systems including desalination plants. This would include municipal and rural drinking water systems, including water treatment plants. It would also include training in laboratory analysis and testing for chemical and biological materials.

(4) Training of well drilling crews in proper techniques in drilling and development of well production. Would include electric logging and material analysis and proper selection of pumps, well screens and other pertinent items.

C. Task Force on Data Collection Networks

This Task Force could be responsible for determining the components and for implementing an adequate data collection network for each country desiring assistance to analyse and assess the situation, recommend components of the system and recommend necessary action to see that the programme is carried out.

D. Committee for Professional Assistance

This Committee could see that teams of consultants or specialists of professional stature be made available to any nation requesting assistance in water-related matters. Such matters could include but need not be limited to assistance in developing national water policy, long range planning, water legislation, rules and regulations for water use, studies and recommendations on governmental infrastructure related to water resources, economic evaluation of priority of water use, assistance in assessing magnitude and quality of surface and groundwater resources, water management techniques and other areas as deemed appropriate. Such teams to be paid for by the country requesting assistance or by the Fund as considered appropriate.

E. Committee for Applied Research

This Committee could examine research facilities presently available for water-related matters and could recommend the establishment of other facilities as deemed necessary to fully cover the needs of all twelve nations of the Council. The Committee could also establish a centre for compiling and disseminating the findings of research, both regional and international to each of the twelve countries comprising the Council. Research findings and scientific articles could be published in technical periodicals and professional journals to give prestige to the research programmes of the area. The Committee could also establish and maintain a reference library for use by the Council nations and could establish and operate a data bank including water resource data for the Council nations. The Committee could investigate the need for a trained manpower data bank.

F. Committee on Subregional Streams and Underground Aquifers

This Committee could assist in initiating studies related to streams, wadis or underground aquifers common to two or more of the Council nations. This Committee would co-operate with existing committees and groups concerning the gathering and analysis of basic data and the development of guidelines and compacts governing the use of such resources.

G. Committee for Environmental and Health Aspects of Water Resource Development.

The Committee is not intended to duplicate existing programmes in health related fields but is intended to ensure that water resource development is done in harmony with environmental and health factors. Close co-operation could be maintained with health organizations. Consultants or specialists could be employed as required to examine projects proposed for implementation to assess and evaluate the effects, both beneficial and adverse, of such proposed programmes on the environment and health of the country concerned. Special attention could be given to the

effects upon coastal and marine water from upstream development. This Committee should investigate the desirability of requiring environmental impact studies for all water resource projects.

H. Committee on Higher Education at Professional Level in Water-Related Fields

This Committee would examine the facilities and curriculum of existing higher educational institutions in Western Asia with the view toward determining the adequacy of present quality and coverages of courses relating to water resources and environmental fields at professional levels. Where deficiencies are noted, action could be taken to bring schooling up to adequate and acceptable levels. Each country would not be expected to provide such training, but somewhere in the region there should be sufficient institutional facilities to fill the needs of the region. This programme could be co-ordinated with existing educational and scholarship programmes within the region.

C. ACTION PROPOSALS AT THE INTERNATIONAL LEVEL

VIII. INTERNATIONAL CO-OPERATION

It is recommended that:

- a) USE OF ADVANCED TECHNIQUES SUCH AS REMOTE SENSING, ISOTOPIES AND OTHER ADVANCED TECHNIQUES FOR EXPLORATION, ASSESSMENT, EVALUATION AND UTILIZATION OF WATER RESOURCES BE APPLIED.
- b) FINDINGS AND EXPERIENCE IN APPLIED RESEARCH AND TECHNIQUES GAINED IN OTHER PARTS OF THE WORLD BE SHARED WITH THE NATIONS OF WESTERN ASIA AND VICE VERSA. THIS WOULD COMPLEMENT SUCH SERVICES RECOMMENDED UNDER THE REGIONAL ACTION PROPOSALS.
- c) COUNTRIES SHARING WATER RESOURCES SHOULD EXCHANGE DATA, ESTABLISH JOINT COMMITTEES, CO-OPERATE IN THE ESTABLISHMENT OF JOINT PROGRAMMES, CO-ORDINATE THE DEVELOPMENT OF SUCH RESOURCES, AND REACH AN AGREEMENT CONCERNING THE SHARING OF SUCH RESOURCES. APPROPRIATE ASSISTANCE FROM INTERNATIONAL AGENCIES AND/OR OTHER APPROPRIATE BODIES, TO BE AGREED UPON BY THE PARTIES SHARING THESE RESOURCES, COULD BE UTILIZED.

- d) CO-OPERATION IN THE ESTABLISHING AND/OR EXPANSION OF A REGIONAL AND INTERNATIONAL HYDROMETEOROLOGICAL NETWORK TO CONSTITUTE A MONITORING AND WARNING SYSTEM FOR THE COUNTRIES CONCERNED.
- e) INVESTIGATE THE POSSIBILITIES OF WEATHER MODIFICATION ON NATIONAL, REGIONAL AND INTERNATIONAL SCALE FOR THE PURPOSE OF RAINFALL AUGMENTATION.
- f) UNDER THE ECONOMIC AND SOCIAL COUNCIL, A COMMISSION ON WATER RESOURCES BE ESTABLISHED WITH REGIONAL SUB-COMMISSIONS. THE OBJECTIVES OF THIS COMMISSION COULD INCLUDE THE FOLLOWING:
 - i) exchange of technical data;
 - ii) fostering the application of new techniques in the field of water resources;
 - iii) the promotion of joint applied research projects and technical co-operation;
 - iv) the establishment of a training centre;
 - v) the promotion of co-operation among riparian countries on matters related to international water basins and encourage direct agreement among riparian countries involved;
 - vi) co-ordinate the activities of the various United Nations agencies dealing with water resource aspects;
 - vii) Regional water resources councils, like the one referred to under Regional Action Proposals will constitute part of this international commission, one it is set up.

