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REPORT OF THE EXECUTIVE SECRETARY ON THE ACTIVITIES OF THE COMMISSION

PROGRESS MADE IN THE IMPLEMENTATION OF THE PROGRAMME OF WORK FOR THE BIENNIUM 1992-1993

Report on

cooperation among ESCWA countries in the field of shared water resources

94-0175

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INTRODUCTION

A. Background and justification

1. The water issue in the ESCWA region is characterized by its national, regional and interregional dimensions. On the national level, most countries of the region are experiencing a water deficit which will peak by the end of this century. On the regional level, many of the shared groundwater and surface water basins are being exploited arbitrarily by the basin countries, which are competing in drawing water out of them in the absence of conventions to regulate the use of these resources in a rational manner. On the interregional level, many of the rivers in the region such as the Nile, the Euphrates and the Tigris, get their water from sources outside the ESCWA region.

2. Therefore, the issue of the exploitation of shared water resources requires technical solutions even though political considerations often prevail. A close look at the map of the ESCWA countries showing the status of the shared water resources underlines the need to rationalize the utilization of those resources. The lack of cooperation and coordination in managing shared water resources may lead to their misuse and to the deterioration of water quality. One of the reasons for the rational management of those resources is the severe shortages of water which the countries of the region are expected to face in the next two decades. Al-Hayat newspaper (issue No. 11197, 10 October 1993) published a summary of a recent report issued by the World Bank in which it was stated:

> "The Bank urges Governments in the Middle East and North Africa to adopt new strategies to resolve the water issue in the region. The World Bank expects renewable water supplies in the region to diminish by 80 per cent per capita water share, which was 3,430 cubic metres (m^3) in 1960, would decrease to 667 m^3 in 2025.
>
> "Per capita water share in the region (river waters and groundwater) is currently 1,473 m^3, and is considered the lowest in the world and much less than the world average, which is 7,685 m^3, for a region as large as the Middle East. Some countries in the region are experiencing a severe shortage of water. Moreover, the amount of water consumed in Saudi Arabia, the Libyan Arab Jamahiriya, the Gulf States and Yemen exceeds the amount of water that could be replenished in those countries. In 2025 the average per capita share of replenishable water resources in Saudi Arabia would be 49 m^3 as compared with 156 m^3 in 1991. That decrease would be due to an increase in population from 15 million in 1991 to 41 million. The report states that Saudi Arabia is consuming more groundwater than could be replaced by rain. In the Libyan Arab Jamahiriya and Yemen, per capita shares of renewable water would be low, ranging between 55 m^3 and 72 m^3. Among the countries of the region whose water consumption had reached the extreme limit permissible in comparison with their available water supplies were Egypt, Israel, Jordan, Algeria, the Islamic Republic of Iran, Morocco and Tunisia. Owing to continued population growth, per capita water share in Egypt (whose current water supplies are estimated at 58.3 billion m^3) would decrease from 1,222 m^3 annually to 645 m^3 while the population would increase from 54 million to 92 million. It was projected that by 2025 per capita water share would be 354 m^3 in Algeria (whose population would reach 53 million), 651 m^3 in Morocco, and 319 m^3 in Tunisia.

"Jordan's renewable water supply is 1 billion m^3, and that its population would increase twofold while per capita water supply would decrease to 91 cubic metres per year (m^3/y). Israel has 1.7 billion m^3 of replenishable internal water resources and 450 million m^3 from other sources, which makes its total water supply 2.15 billion m^3/y. The World Bank expects per capita average share of water in the region to decrease from 467 m^3 to 311 m^3. The most positive projections are those concerning Lebanon and Iraq: per capita average share of water in Lebanon was expected to be 809 m^3, all of it from internal sources in spite of the fact that 0.86 billion m^3 of water go to Israel; in Iraq per capita share is expected to be 2,000 m^3."

3. There are numerous other studies which caution against the discouraging possibility of failure to reach agreement on allocation of shared water resources. For instance, both the Syrian Arab Republic and Iraq have misgivings about Turkish projects on the upper Euphrates and Tigris and the water projects aimed at utilizing the waters of the Litani, Wazzani and Yarmouk rivers give rise to great fears, as does Israel's drawing of water from the Jordan and Yarmouk rivers, in addition to its arbitrary use of groundwater in the West Bank and Gaza Strip. The water projects of some Upper Nile basin countries also give rise to fears in downstream countries, although the eight riparian States concerned are subject to relevant international conventions.

4. The dangers posed for the region and its future by the lack of cooperation and coordination in water resources utilization is made clear by the steady population growth in most ESCWA countries, including the abnormal increase in population due to migration and reverse migration and also by the aspirations of the countries of the region to expand their agricultural and industrial activities, which entails more water resources to meet those requirements. This in addition to the fact that the ESCWA region is generally considered as having limited water resources which are threatened by depletion and/or deterioration in quality because of numerous factors, among which are overexploitation of groundwater, pollution of surface water resources, inefficiency of irrigation and drainage projects, misuse of water and industrial wastewater, and sometimes lack of or inefficiency of sanitation networks.

5. In the light of these determinants of water resources and as a result of the systems and methods presently used, especially in the field of irrigation, and in the absence of or in view of the weakness of international conventions to regulate the allocation of water resources among countries of the same basin, countries sharing water basins have conflicting interests and therefore compete in making use of the waters of the shared basins regardless of the impact of their water projects on the rights and interests of the other basin States.

6. The present deficit in water supplies in most ESCWA countries is estimated to range between 20 and 30 per cent of their requirements. If present water-use practices continue and no new water resources are found, and if no agreement is reached on ways of developing shared water resources in a balanced and equitable manner, the water situation could reach a critical point by the year 2000, especially in view of the depletion of most of the currently utilized water resources and the deterioration in their water quality.

7. The overexploitation of shared groundwater basins in some countries of the region--the Dammam and Disi basins--is also likely to lead to a deterioration in the hydrological characteristics of those basins and therefore the agricultural projects undertaken in those basins could have negative results.

8. In view of the situation in the region, Jordan and the occupied Palestinian territories are considered to be the most disadvantaged with regard to the use of their due share of water resources. Jordan is presently not using more than 40 per cent of its share of the water of the Yarmouk river because the political situation prevailing in the region prevented the construction of the Al-Wahdah Dam. It cannot use its share of the water of the Jordan River south of Lake Tiberias because of its high salinity. The West Bank and Gaza Strip suffer from severe shortages of water as per capita water share for all uses in these two areas (including domestic, agricultural and industrial uses) is the lowest in the region, not exceeding 166 m^3/y in the Gaza Strip and 128 m^3/y in the West Bank, whereas average per capita water consumption in Israel is estimated at about 476 m^3/y. It is known that per capita water share in the settlements is larger than within Israel itself. The present overexploitation of underground water in the West Bank threatens the future yield of this underground reservoir. Arab irrigation wells in several areas have also been affected by Israeli drilling of deep wells in those areas.

9. In the Gaza Strip, the only source of water, which is the groundwater basin, is threatened by depletion and salinization because of sea water intrusion, and arbitrary pumping of underground water in the nearby areas.

10. The same situation prevails in the Tigris and Euphrates basins as both rivers cross Turkey, the Syrian Arab Republic and Iraq. Until 1973, no major dams were built on these two rivers, with the exception of some flood control structures which were set up in Iraq to use the water of the two rivers for agricultural purposes. But after 1973, several dams were built on the Euphrates in Turkey, the Syrian Arab Republic and Iraq. Then, major dams were constructed upstream of the Tigris and Euphrates, in particular the Keban and Ataturk dams whose storage capacity represents 75 per cent of the total storage capacity of the dams built on the Euphrates in the three countries, which has greatly affected the flow of these two rivers, and especially the Euphrates in the Syrian Arab Republic and Iraq, in addition to the deterioration in the quality of the Euphrates water in those two countries.

11. In the water conferences and meetings convened by the United Nations during the past two decades, a number of resolutions and plans which give special importance to shared water resources planning, conservation and rational utilization were adopted. The most important of those conferences and meetings were:

(a) The United Nations Water Conference held at Mar del Plata, Argentina, in 1977;

(b) The First United Nations Interregional Meeting of International River Organizations held at Dakar in 1981;

(c) The International Conference on Water and the Environment: Development Issues for the 21st Century, held at Dublin in 1992;

(d) The United Nations Conference on Environment and Development (Earth Summit) held at Rio de Janeiro, Brazil, in 1992.

12. The International Law Commission of the United Nations was expected to complete in 1993 the text of the law on the non-navigational uses of international watercourses so as to provide clear legal guidelines for riparian States.

13. In view of the preceding, efforts should be intensified to draw up international conventions to regulate the rights of riparian countries in the region to utilize, develop and manage shared water resources to meet the water requirements of their people on an equitable basis. Once this goal is achieved, water resources development and utilization planning may become an important factor in strengthening regional cooperation and stability in the region instead of being the main cause of the political and military conflicts witnessed by the region during the last four decades.

B. Purpose of the report

14. In view of the importance of shared water resources, the ESCWA programme of work for the biennium 1992-1993 included several activities, among which was the present report on the major shared surface and underground water basins: the aim of this report was to formulate recommendations to help to determine water policies and practices that ensured the rational exploitation of those basins and find a basis for dialogue between concerned national authorities in order to reach a common stand about the next phases.

15. ESCWA published a study (in Arabic), dated 26 January 1993, on water basins in the region that raise problems between riparian countries. The study was on water and peace in the Middle East (E/ESCWA/ENR/1993/3). This document was distributed to the concerned countries, and differing responses to it have been received. The present report deals with those responses.

16. In order to formulate practical recommendations to be included in the present report, officers from the water programme of ESCWA visited the countries of the region and met with experts in the various water departments of the concerned government ministries in order to review cooperation between riparian countries. The following topics were discussed:

(a) Technical studies undertaken by riparian countries;

(b) Determining the factors that affect the conservation and rational utilization of shared water resources;

(c) Assessing the planning of shared water resources in the ESCWA region;

(d) Assessing adopted policies and the activities undertaken to develop shared water resources;

(e) Exploring views about the cooperation mechanism which can be used in the management of shared water resources.

I. BASIN OF THE JORDAN RIVER AND ITS TRIBUTARIES

A. Sources of the Jordan River

1. The Jordan River and its tributaries north of Lake Tiberias

17. The Jordan River and its tributaries are the main source of surface water in the Jordan valley. The Jordan River runs north-south, originating from high discharge springs upstream of its three tributaries: the Hasbani in Lebanon, the Banias in the Syrian Arab Republic, and Al-Dan in Israel. The total discharge of these three rivers as they enter the Lake Al-Hola area is about 525 million m^3/y (150 million m^3 from Hasbani, 125 million m^3 from Banias, and 250 million m^3 from Al-Dan).

18. These rivers join inside Israel at a point 6 kilometres (km) away from its northern borders, north of Lake Al-Hola. Their water then runs through a drainage canal which was built by Israel in the area of Lake Al-Hola in the 1950s to collect additional water from winter springs and wadis. The total discharge of the canal as it enters Lake Tiberias is 685 million m^3 of water per year. Mineral springs and winter wadis in the area of Lake Tiberias add around 130 million m^3 per year so that the total discharge of the upper Jordan basin up to Lake Tiberias is about 815 million m^3.

19. The Jordan River meets its main tributary (the Yarmouk) at a point 12 km south of Lake Tiberias. The Jordan River is also fed by a number of secondary wadis from the East Bank and West Bank whose discharge is estimated at about 150 million m^3/y and 10 million m^3/y respectively.

20. Since 1913 the water of the Jordan River and its tributaries has been the subject of numerous Arab, Israeli, and international plans and projects the aim of which was to regulate the utilization of Jordan's water and allocate water among the riparians: the Syrian Arab Republic, Lebanon, Jordan, Palestine and Israel. The last of these projects was the amended Johnston plan (1955) (see E/ESCWA/ENR1993/3 [Arabic only]).

21. According to that plan, the water of the Jordan River was to be allocated in the following manner:

(a) The Syrian Arab Republic: 20 million m^3/y from the Banias river which originates in the Syrian Arab Republic and 22 million m^3/y from the Jordan River west of the Golan Heights;

(b) Lebanon: 35 million m^3/y from the Hasbani river, which originates in Lebanon, and all the water of the Litani river;

(c) Jordan: 100 million m^3/y from the Jordan River south of Lake Tiberias, provided its salt content makes it appropriate for irrigation purposes.

(d) Israel: it can divert the remaining water of the Jordan River once the other Arab countries have taken their full share.

The Johnston plan was rejected by both the Arab States and Israel although the technical committees approved the proposed allocation of water, and consequently each riparian country started implementing its own projects.

2. The Yarmouk river

22. The Yarmouk river is considered the biggest tributary of the Jordan River; it originates in the Syrian Arab Republic and flows westwards towards the Jordan rift valley where it meets the Jordan River, 12 km south of Lake Tiberias. The basin of this river is shared by the Syrian Arab Republic, Jordan and Israel. The normal discharge of the Yarmouk river is about 480 million m^3/y, of which 200 million m^3/y is spring water which constitutes the permanent flow of the river, and the remaining 280 million m^3/y winter floodwater.

23. According to the water-sharing convention concluded between Jordan and the Syrian Arab Republic in 1953 and amended in 1987, the latter uses the water of the high altitude springs (250 m^3 above sea level). The volume of water coming from these springs is estimated at 90 million m^3/y. In compensation for this abstraction of water from the Yarmouk, it was agreed that Jordan build a dam on the Yarmouk at the Magarin site at an altitude of 100 m, which can be enlarged in the future and whose total storage capacity is 220 million m^3. This dam will enable Jordan, in the long run, to continue irrigating its agricultural projects, in addition to providing 50 million m^3/y of drinking water.

24. Since 1913 the water of the Yarmouk river has also been one of the main elements of Arab, American and Israeli (after 1948) projects and plans aimed at utilizing the water of the river and that of the Jordan River. The last of those plans was the Johnston plan relative to the Yarmouk river which was amended in 1955. This project distributed the water of the Yarmouk in the following manner:

(a) The Syrian Arab Republic: 90 million m^3/y;

(b) Jordan: 300 million m^3/y by means of building a dam at the Magarin site;

(c) Israel: 25 million m^3/y, in addition to the surplus which Jordan cannot divert from the river water through the Adasiya tunnel. That surplus was then estimated at about 80 million m^3/y, while a subsequent study in 1979 carried out by Harza, an American company, for the Al-Wahdah dam project estimated it at about 55 million m^3/y.

25. Although this plan was not accepted by the Israeli Government and the League of Arab States, the proposed allocation of water was approved by the technical committees, and the Johnston plan became a reference used by every party in resolving disputes and claims about the allocation of water of the river, each party having its own interpretation.

26. One of the main characteristics of the final Johnston plan of 1955 was the fact that Israel was not allowed to divert any water from the Jordan River and its tributaries until all the countries sharing the basin had taken their full share of water.

B. The utilization of the waters of the Jordan River and its tributaries

27. Jordan is currently using less than 40 per cent of its share of the water of the Yarmouk river because it was not able, for political reasons, to build the Al-Wahdah dam at the Magarin site which would have enabled it to regulate the winter flow of the Yarmouk river, whereas Israel is using about 100 million m^3/y to irrigate the Yarmouk triangle by pumping water to Lake Tiberias and the Beisan plain from the Rottenburg reservoir at the junction of the Yarmouk and Jordan rivers south of Lake Tiberias. Israel also uses all the water of the tributaries of the Jordan River north of Lake Tiberias by pumping most of it through the national water carrier to the coastal plain and the Negev Desert. The water utilization and diversion projects have reduced by half the flow of the Yarmouk river as it enters the Jordan valley. As for the Syrian Arab Republic, it is using its share which includes the water of the high altitude springs which feed the Yarmouk, according to the convention concluded with Jordan in 1953 and which was amended in 1987. The total annual discharge of water from these springs is about 90 million m^3/y, which is equal to the Syrian Arab Republic's share according to the Johnston plan. However, the Syrian Arab Republic has built in the upper Yarmouk Basin a number of small and medium dams (21 dams) with a total storage capacity of about 100 million m^3.

28. Jordan is currently using about 110 million m^3 of water per annum for irrigation purposes in the Jordan valley by diverting it to the King Abdallah Canal, as compared with about 150 million m^3 previously.

29. Jordan has been planning since the 1960s to build the Al-Wahdah dam on the Yarmouk river at Magarin to store water, regulate the winter water flow and remedy the water deficit in summer. However, the political situation prevailing in the region has prevented the implementation of that project even though Jordan has completed the technical and economic feasibility study and the final design study relevant to it. The proposed dam is 100 m high and its preliminary storage capacity about 220 million m^3. Jordan is also planning to divert a portion of the flood water which feeds the Yarmouk river to the east of the site of the proposed Al-Wahdah dam to store it in a dam to be built on the Wadi Mallaha about 70 km south of the Yarmouk river to cover the deficit in irrigation water in the southern part of the Jordan valley. The technical and economic feasibility study for the proposed Karamah dam, which will have a storage capacity of 35 to 45 million m^3 of the winter flow of the Yarmouk river, has now been completed. The building of the Al-Wahdah and Karamah dams will not affect irrigation requirements in the Yarmouk triangle in Israel, which are estimated at 25 million m^3 per annum.

30. The water of the Jordan River south of Lake Tiberias is not used very much, because of its high salinity. The Syrian Arab Republic and Lebanon are not using their share of the water of the Jordan River and its tributaries north of Lake Tiberias because of the current political and military situation. The Jordan River water is used mainly by Israel.

C. The Syrian Arab Republic and the waters of the Jordan River and its tributaries

31. The Banias originates in the Syrian Arab Republic and is one of the tributaries of the Jordan River, its annual discharge being about 125 million^3 of water. The Hasbani river constitutes the border limit between the Syrian Arab Republic and Israel for a distance of 6 km. Thus, the Syrian Arab Republic has the right, according to international custom, to use the water of both rivers to meet local needs in the Golan Heights either for drinking or agricultural purposes. Therefore, Syrian rights in this area have to be taken into account, taking into consideration the fact that the 1955 Johnston plan allotted to the Syrian Arab Republic 20 million m^3/y from the Banias river, 22 million m^3 from the Jordan River, west of the Golan Heights, and 90 million m^3 from the Yarmouk river, as noted above. The above-mentioned convention concluded between the Syrian Arab Republic and Jordan stipulated that the Syrian Arab Republic was entitled to use the water of the high altitude springs (250 m above sea level) that feed the Yarmouk river. The discharge from those springs is 90 million m^3 per annum approximately.

32. The Golan Heights have become, as a result of their occupation by Israel, one of the main sources of water in Israel and the Israeli settlements in the occupied territories, as 30 per cent of the water consumed in Israel and the Israeli settlements comes from the Golan Heights, where rainfall ranges between 1,500 and 1,700 mm/y. There are in the Golan Heights about 100 springs, the total annual discharge of which ranges between 50 and 60 million m^3.

33. In 1971, Israel started using intensively the water of the Golan Heights, as Mikrout, an Israeli corporation, started drilling a number of artesian wells for the Israeli settlements. Israel drew up a plan to enable it to use 46 million m^3 yearly of water from the Golan Heights by the year 1985, and settle 50,000 persons in the area. The water consumption of the Israeli settlements in the Golan Heights in 1986 was about 38 million m^3.

D. Lebanon and the waters of the Jordan River and its tributaries and the Litani river

34. The Hasbani river originates in Lebanon and is a tributary of the Jordan River. Its annual discharge was estimated at about 35 million m^3 in the 1955 Johnston plan. As for the Litani river, it is a Lebanese watercourse as both its fountainhead and mouth are in Lebanon and therefore cannot be regarded as an international river. Lebanon is entitled to meet all its needs from its water before considering exporting the surplus to neighbouring countries, as was acknowledged by the 1955 Johnston plan. The exporting of any water surplus from the Litani has to be the object of bilateral conventions.

35. Israel started using the water of the Litani river in 1978 by means of pumps of a capacity of 150 million m^3 per annum which were installed near the Khardali bridge. It is also making use of the water of the Wazzani river whose annual discharge is 65 million m^3. In addition, after its invasion of Lebanon in 1982, Israel drilled an 18-km tunnel which links the Litani to Israel.

36. It is true that Lebanon has plenty of water at present, but extensive areas of Lebanon are experiencing a shortage of water for irrigation and drinking purposes. The present irrigated area in Lebanon does not exceed 45,000 hectares whereas the area that has to be irrigated is approximately 360,000 hectares. The Beqa'a and southern areas of the country alone need 1 billion m^3 of water yearly (800 million m^3 for irrigation, 85 million m^3 for drinking, 115 million m^3 for industry. The development of those areas has been at a halt since the mid-1970s because of the situation in the region.

37. Thus, it is obvious that Lebanon will need its water and it is only logical, before exporting the surplus, that it meets all its needs when it starts developing the southern part of the country once the requirements of political stability and security in the region have been fulfilled.

II. WATER AND WATER-USE IN THE WEST BANK AND THE GAZA STRIP

A. The West Bank

38. Rain is the main source of groundwater, springs, watercourses and seasonal torrential streams. The maximum total volume of renewable water resources which can be used in the West Bank is estimated at about 660 million m^3, of which 600 million m^3 is represented by groundwater (of which 114 million m^3 flow in the form of springs within the West Bank) and 60 million m^3 by surface outpour in the form of winter floods.

39. No accurate data are available about the volume of water pumped to be used by Israel and the Israeli settlements. But there are signs that indicate depletion of water resources because of the Israeli pumping.

40. The Arab population's water consumption in the West Bank was estimated at around 115 million m^3 in 1990, all of it coming from underground sources. As the Arab population in that year was about 900,000, the per capita share is 128 m^3 for all uses, i.e. about 23 per cent of per capita share for the Israelis, which is estimated at about 476 m^3 per year.

41. Currently there are plans to increase per capita water share in the West Bank to 137 million m^3 by the year 2000, which represents an increase of 22 million m^3, i.e. 2 per cent per annum. This percentage is less than the population growth rate and will not provide any opportunity to raise living standards or implement agricultural and industrial projects. These plans also aim at increasing the settlers' water share in the West Bank in preparation for expanding the settlements, which will lead to further depletion of groundwater resources. Groundwater resources in the West Bank will be sufficient to meet the water requirements of the Arab population for domestic, industrial and agricultural uses, provided measures are taken to prevent their exhaustion. The water resources of the West Bank can also meet part of the drinking water requirements in the Gaza Strip in the future. Groundwater resources in the West Bank can be increased by building small dams to retain winter flood water in order to recharge groundwater aquifers by using appropriate means, and by managing judiciously the utilization of the aquifers.

B. The Gaza Strip

42. The Gaza Strip depends on its groundwater reservoir to meet its various water requirements. The annual recharge capacity of that groundwater reservoir is estimated at about 40 million m^3, but the amount being extracted amounts in fact to 100 million m^3. The volume of water depleted is about 60 per cent of total water pumped. Therefore, the groundwater reservoir is being depleted, which is having a negative impact on the usability of its water for drinking and the irrigation of citrus trees. As a result, the area planted with citrus trees decreased by more than 50 per cent as compared with 1967, which led to increased salinity of the water and raised the level of the flood water retained upstream the Gaza Valley, which is used in replenishing the groundwater reservoir in the Gaza Strip.

43. If the present situation continues, the salinity of the water of that reservoir will increase to the point that it will no longer be possible to use it for drinking and cultivating citrus trees, the main agricultural activity in the Strip. This could happen within 10 years if appropriate measures are not taken and if new sources of water are not found. The situation is aggravated by drainage water which pollutes groundwater with chemical fertilizers and pesticides residues, in addition to organic pollutants carried by wastewater.

44. The total amount of water used for all domestic, industrial, and agricultural purposes in the Gaza Strip in 1990 was estimated at about 100 million m^3. As the population in the Gaza Strip in the same year was 0.6 million, the per capita share of water is 116 m^3 per year. But since the quantity of water available from the groundwater basin in the Strip will decrease gradually because of the continous increase in water salinity, per capita water share will also decline if no new sources of water are secured from outside the Strip. This decrease in annual per capita share of water will affect living standards as well as agricultural and economic activity.

45. In view of the critical water situation in the Gaza Strip, the following measures are recommended to improve the situation:

(a) Floodwater should not be retained in the Gaza valley and should be allowed to flow in its natural course, and special structures should be built at specific locations to increase groundwater feeding from that water and prevent it from reaching the sea;

(b) New sources of irrigation water such as water desalination and treatment of wastewater should be used in order to reduce pumping from the groundwater reservoir;

(c) The groundwater reservoir should be artificially recharged with water drawn from outside the Strip to prevent further deterioration of the quality of its water;

(d) Drinking water should be provided from appropriate sources;

(e) Since the Jordan River water diverted from Lake Tiberias reaches, by means of the National Water Carrier, Israeli settlements located to the south and east of the Gaza Strip where it is used for irrigation, a portion of the Palestinian rights in the Jordan River water can be used for irrigation and artificial groundwater recharge in the Gaza Strip as well.

III. ISRAEL AND WATER RESOURCES

A. Water sources and uses in Israel

46. Before 1967, Israel used to meet its needs by using the water of the groundwater basin in the coastal plain, as well as springwater, and the water of the Jordan River and its tributaries. Eventually, the groundwater basin in the coastal plain was severely depleted, which led to sea water infiltration several kilometres inland in some areas and to the salinization of groundwater.

47. Among the chief results of the 1967 war was that Israel gained control of all groundwater sources in the West Bank as well as the upstream tributaries of the Jordan River north of Lake Tiberias, especially the Hasbani and Banias rivers, which makes it very difficult in practice for the Syrian Arab Republic and Lebanon to use the water of these two rivers. Israel also gained control of water sources in the Golan Heights and its occupation of the Heights enabled it to use more of their surface water and groundwater in the western basin as well as the water of the Himma spring. Moreover, the invasion of Lebanon in 1982 gained Israel access to the Litani and Wazzani rivers and enabled it to use their water.

48. Israel's use of water in millions of m^3 over time can be summarized in the following manner:

Source	1949	1975	1981	1990
Jordan river and Lake Tiberias	150	570	600	600
Yarmouk river	-	50	100	100
Groundwater	200	1 150	1 035	1 215
Floodwater (dams)			20	20
Litani river				
Wazzani spring	-	-	-	215*
Total	350	1 770	1 755	2 150

* Preliminary estimates.

49. Israel's population was estimated in 1990 at about 4.5 million. As Israel's consumption of water in that year was 2,150 million m^3, per capita water share for all uses was estimated at around 476 m^3 per year, but per capita water share in the settlements in the occupied territories is much higher, and the migration of Jews from all over the world to Israel will result in a continued and abnormal increase in water requirements.

B. Israeli water practices in the occupied territories

50. Since 1967, Israel took several decisions with a view to controlling water sources and uses in the occupied territories. The most important Israeli decisions and practices include the following:

(a) It is prohibited to build, own or operate any source of water or irrigation project without official authorization from the military governor.

(b) More than 300 wells owned by Palestinians who left the occupied territories after their occupation by Israel in 1967 were confiscated. In addition, the Israeli authorities set a limit for the amount of water which can be extracted by the Arab owners of the remaining wells and compelled those Arab owners to install meters on their wells: fines and penalties are imposed on those who exceed the determined amount. Israeli authorities also set the price of the water consumed.

(c) Arab inhabitants were prohibited from drilling any new wells except in cases of extreme necessity such as providing municipalities with drinking water. And when the authorization to drill is granted, drilling is forbidden beyond a depth of 300 feet. The occupation authorities often impose as a condition for authorizing the drilling of a new well that nearby Israeli settlements or military camps be provided with its water or that it be linked to the Israeli National Water Carrier which is managed by the Mikrout company.

(d) Israeli settlers in the West Bank were authorized to drill wells up to a depth of 500 m in the vicinity of Arab wells and springs, which led to the drying up of those wells and springs or reduced their discharge.

(e) The agricultural border area of about 140,000 dunums in the Jordan valley which used to be cultivated by Arab farmers was closed and its owners were expelled. The irrigation canal in the Jiftilik area in the West Bank was destroyed.

(f) The Arab inhabitants of the Golan Heights were prohibited from building reservoirs and wells to collect rainwater without prior authorization from the Mikrout water company. Some of them were compelled to destroy their wells and reservoirs. The occupation authorities even used explosives to destroy some of those wells. Israel spared only 3 or 4 of the 400 reservoirs which had been used in the Golan Heights before the occupation.

(g) The water of Ram Lake in the Golan Heights was diverted to meet the needs of Israeli settlements, which deprived the Arab population of a major portion of the water they need for drinking and irrigation purposes.

(h) The water of the Wazzani spring and a portion of the water of the Litani river were also diverted.

51. These points should be examined in any discussions to be held now or in the future between the negotiating parties either in the bilateral or multilateral talks.

IV. THE PROPOSED TURKISH PEACE PIPELINE PROJECT AND ITS CONNECTION WITH THE WATER RESOURCES OF THE TIGRIS AND THE EUPHRATES

A. Description of the project

52. A former Turkish president, Turgut Ozal, proposed several years ago a Peace Pipeline project to provide the Gulf area with freshwater by means of two pipelines which would cross eastern Mediterranean countries. The feasibility study for the project, which was financed by both Kuwait and the United Arab Emirates, demonstrated that the cost would be enormous.

53. The project would consist mainly in drawing 2.5 billion m^3 of water from the Seyhan and Jeyhan rivers in southern Turkey by means of a 3 to 4 m diameter main pipeline and 1 to 2 m diameter secondary pipelines. The water would be carried by main pipeline from Turkey to the Syrian Arab Republic, passing by the towns of Aleppo and Hamah; then it would divide into two main branches, the first one heading southeast towards Kuwait, eastern Saudi Arabia, Bahrain, Qatar, Dubai and Oman. The second one would head southward, passing by Damascus, Amman, Al-Madinah, Makkah, Jeddah and ending in Yanbu.

54. In this respect, Israel is looking forward to deriving benefit from this project once it has been approved, under the cover of benefiting both Jordan and Palestine, by means of a secondary pipeline linking Damascus to the Yarmouk river via the Golan Heights and ultimately reaching the Jordan River, which will help to improve the quality of water of that river and make it appropriate for irrigation all along its course.

55. As there is a water surplus in Turkey and since both the Syrian Arab Republic and Iraq are expected to face a water deficit and in view of the major Turkish water projects on the Tigris and Euphrates Rivers and their tributaries and their adverse effects on the Euphrates basin in both the Syrian Arab Republic and Iraq, disputes may arise between these States unless agreement is reached on ways of utilizing and managing shared water resources and a just solution is found to this issue.

B. The objective of the project and its expected quantities of water

56. Available studies on water sources indicate that the Syrian Arab Republic will face a deficit of up to 1 billion m^3 by the year 2000 because of the reduced flow of the Euphrates River resulting from the water projects being carried out in the headwater State (Turkey) and also because of the pollution of water with insecticide and fertilizer residues and increased salinity. At the moment, some Syrian towns, and in particular Damascus and Aleppo, are experiencing acute shortages of water in summer as well as a power deficit as a result of the reduced flow of the Euphrates River because of the dams being built in Turkey, which prevent the Syrian Arab Republic from generating as much electric power from the Euphrates dam as before.

57. The idea of this project necessarily leads to the regional issues related to the Euphrates and Tigris basins as the Tigris and Euphrates Rivers and their tributaries constitute the main source of water in Iraq, the Syrian Arab Republic and Turkey. Both rivers originate in mountainous areas in Turkey. Within Turkey, the Euphrates is made up of the junction of its two main branches; within Syrian boundaries it is joined by three tributaries, the most important of which is the Khabour river, then it enters Iraq where it is reinforced by winter floodwater mainly. The Euphrates' length from its source till it joins the Tigris in the Shatt al-Arab is 2,940 km. Its annual average discharge is 28 billion m^3 as it enters the Syrian Arab Republic and 31 billion m^3 at the Iraqi border. As for the Tigris, it also originates in the eastern Taurus chain in Turkey where it is joined by three main tributaries whose total annual discharge is about 21 billion m^3, then it crosses the Syrian Arab Republic for a distance of 60 km, then Iraq where it is joined by five tributaries whose average annual discharge is about 27 billion m^3. The length of the Tigris River from its source till it joins the Euphrates in the Shatt al-Arab is 1,900 km, of which 1,355 km are within Iraqi boundaries, 60 km within the boundaries of the Syrian Arab Republic, and 485 km within Turkey.

58. The flow of both the Tigris and the Euphrates Rivers is subject to important seasonal and annual fluctuations, as their maximum discharge is three to four times greater than their minimum discharge in wet and dry years respectively.

59. No dams were built on the Tigris and Euphrates Rivers in the Syrian Arab Republic and Turkey until 1973 while in Iraq structures were built on both rivers to control floodwater in both rivers and to use their water for irrigation and other purposes. But after 1973, Turkey, the Syrian Arab Republic and Iraq constructed a number of dams on the Euphrates. Turkey built the Keban, Qarqaba and Attaturk dams with a total storage capacity of 89 billion m^3 whereas the Syrian Arab Republic built the Tabaqa, Ba'ath and Tashreen dams with a total storage capacity of 16.9 billion m^3. Iraq constructed the Qadisiya dam with a storage capacity of 8.2 billion m^3. Turkey is planning to build other dams among which are the Birat Jisk and Qarat Qamish dams while Iraq is planning to build the Najma dam.

60. In this respect, it is worth noting that ensuring the quality of the water of these shared water resources and ensuring that it remains suitable for agricultural and other uses is no less important than the quantity of water which can be produced by them. Moreover, Turkey's use of the groundwater basins which feed some of the Euphrates fountainheads and tributaries, and its diversion of some tributaries and small rivers which used to flow into the Syrian Arab Republic is another important factor to be taken into consideration, since the diversion of these small rivers and tributaries has deprived some remote rural areas of the traditional, and perhaps the unique, source of water they used to rely on to meet their requirements.

61. Permanent peace and stability will be achieved between the countries sharing the Tigris and Euphrates basins only through close cooperation between them in planning water projects in the basins and tributaries of these two rivers and undertaking studies to evaluate the expected adverse effects of those projects on existing installations in the Syrian Arab Republic and Iraq, especially in the upper courses of both rivers.

62. In this respect, it is suggested that Iraq and the Syrian Arab Republic agree first on how to share the water flowing from Turkey between them before trying to reach agreement with Turkey on the volume of water which is to be allowed to flow into the Syrian Arab Republic as the share of both the Syrian Arab Republic and Iraq. Failing that, it will be very difficult for the proposed pipeline to cross the Syrian Arab Republic.

63. From the preceding paragraphs, one can infer that building the proposed pipeline is not sufficient to achieve peace in the region, as the countries concerned by that pipeline have to solve the issue of regional water rights through close cooperation between them and on the basis of equity and by applying a single standard.

V. THE NILE WATER AND WATER REQUIREMENTS IN EGYPT

64. The Nile is the second longest river in the world, its length from its fountainhead in the south near Lake Tanganyika at latitude 4^oS to its estuary in the Mediterranean Sea at latitude 31^oN being about 6,700 km. The

area covered by the Nile basin is about 2.9 million km^2, or one tenth of the area of the African continent, and includes portions of eight countries: Uganda, Kenya, the United Republic of Tanzania, Rwanda, Zaire, Ethiopia, the Sudan and Egypt.

65. The flow of the Nile River is characterized by daily, monthly, seasonal and annual fluctuations in addition to locational variation in the same period of time. Whereas the Nile's flow in Aswan reaches its lowest level in summer, especially in drought years, it reaches in the same season its highest level in the inundation in the Delta area, which can surpass its lowest level 50 times over. The Nile's flow during the season of its lowest water level, which lasts six months, is one fifth of its average annual discharge whereas it reaches four fifths of that average in the other six months.

66. The annual fluctuation is important as the river's annual discharge can drop to 40 billion m^3 in rainless years, as compared with 150 billion m^3 in rainy years, almost four times the volume of its discharge in rainless years.

67. According to Egyptian official statistics, the water resources available to Egypt amount to 61.5 billion m^3 annually, distributed in the following manner:

(a) 55.5 billion m^3 from the Nile River according to the convention concluded between Egypt and the Sudan in 1959 and by virtue of which the two countries shared the water of the High Dam;

(b) 2 billion m^3 of groundwater from wells;

(c) 4 billion m^3 of drainage water.

68. Egypt consumes most of these water resources in the following manner:

(a) 53.5 billion m^3 in agriculture (i.e. 97 per cent of Egypt's share in the Nile water);

(b) 3 billion m^3 for drinking water and factories;

(c) 2.5 billion m^3 for navigational purposes in January.

69. Egypt's total consumption of water may reach 58.5 billion m^3, i.e. 95.1 per cent of its total water resources, so that only 3 billion m^3 remain from the available water resources.

70. On the other hand, the Egyptian Ministry of Housing and Facilities intends to reclaim and cultivate 2.8 million feddan by the year 2000. The reclamation and cultivation of this area requires up to 17 billion m^3 of water, which means that the deficit in the amount of water required for reclaiming the land will reach approximately 14 billion m^3 in the year 2000, according to present utilization rates.

71. One can infer from the preceding that Egypt will need all of its share of the Nile water and that it will need to develop other water resources in the near future to avoid water shortages. One should also take into account the fact that water rights in the utilization of the Nile water concern the headwater States as well as the other watercourse States.

VI. SANDSTONE AQUIFER SHARED BY JORDAN AND SAUDI ARABIA IN THE DISI-TABUK AREA

72. This aquifer was, and is still, the object of numerous studies in both Jordan and Saudi Arabia, the most important of which was the groundwater simulation model that was calibrated before and after the development of the Tabuk field began, for two consecutive quarters.

73. The aquifers in this basin include two formations: the Kharim formation (150-160 m thick sand and clay strata of low permeability), and the Disi formation (200 to over 1,000 m thick sand strata of high permeability and productivity). However, the hydraulic characteristics of these two formations differ from one location to another, and in some locations, productivity reaches 100 litres per second.

74. It is worth mentioning that many important agricultural projects, and especially projects for producing wheat, vegetables and fodder, depend on the water drawn from this aquifer. However, the two neighbouring countries have not so far established any common mechanism to manage this shared groundwater resource, which opens the door for overexploitation, the adverse effects of which are reflected in lower water level in the aquifer. If the present rate of utilization continues, the volume of the water in the aquifer is expected to decrease, which will lead to the deterioration of the quality of the aquifer water.

VII. THE GROUNDWATER RESERVOIR (DAMMAM BASIN) COMMON BETWEEN SAUDI ARABIA, BAHRAIN, QATAR, KUWAIT, THE UNITED ARAB EMIRATES AND OMAN

75. The Dammam formation (limestone, dolomite, clay and marl) is considered the main aquifer shared by the Gulf States (the United Arab Emirates, Bahrain, Qatar, Kuwait, Saudi Arabia and Oman). Its exploitation is economic, as water is near the surface and easy to dig, especially in eastern Saudi Arabia, Bahrain and Qatar. In Oman, the formation is considered one hydrogeological unit in spite of interference of other aquifers. The quality of water is considered mediocre to poor (1,000-6,000 milligrams per litre [mg/l]) and deteriorates the more one moves southeastwards in the Gulf region (2,500-3,500 mg/l in Bahrain).[13/]

76. In general, the water of this aquifer is used for agriculture and industry, and some of it is used as drinking water. In Bahrain, more than 100 million m^3 of water is extracted for these purposes. In Kuwait the Dammam formation is considered one of the main sources of water as water is found at reasonable depths ranging between 120 m and 400 m and is used for agricultural purposes, and some of it is also mixed with desalinated water for drinking purposes. In Oman, the quality of the aquifer water is poor and for that reason its use is limited to some operations related to oilfields development and to some scattered residential areas. It is worth mentioning that the utilization of this shared groundwater resource is not carried out in a coordinated manner among the neighbouring countries and no common institution has been set up so far to develop and utilize this resource in a rational manner.

VIII. GENERAL PROPOSALS AND RECOMMENDATIONS

77. In the light of the preceding, the following recommendations can be made:

(1) An integrated and comprehensive regional and interregional plan should be drawn up for the utilization of shared water resources. It should clearly identify water rights to be agreed upon by the concerned States in a way that benefits each of them and achieves water and environmental equilibrium in the region. The United Nations specialized agencies should play an essential role in this respect with the participation of regional Arab organizations active in the water sector.

(2) Joint management should be set up for shared basins, and specialized technical committees should be established by those institutions as appropriate, in order to ensure rational management of those basins. The setting up of such committees would be facilitated by the establishment of a regional coordinating council for water in the region as was mentioned in another report to the Commission in this respect (see ESCWA/17/4(Part I)/Add.4).

(3) National task forces consisting of experts should be constituted and entrusted with establishing a water sector database and examining closely studies on water basins at the national level. One of the members of each task force should participate in the specialized technical committees set up by the joint management.

(4) Joint programmes should be set up to gather information, draw up charts, evaluate projects, undertake water research and studies, and prepare and train technical staff.

(5) Water studies and research should be undertaken in cooperation with international organizations, as needed, in order to manage and develop shared water basins.

(6) Efforts should be made to improve irrigation methods and reduce evaporation and water loss so that the scarce water resources available in the region suffice to meet local requirements in the foreseeable future.

(7) If there were a surplus of water from the Litani river after the water requirements of southern Lebanon had been met, an agreement could be made to meet some of the requirements of the neighbouring countries by using that surplus.

(8) The drinking water requirements of the Gaza Strip can be met by desalinating sea water while groundwater can be used for agricultural purposes provided groundwater aquifers are artificially recharged. In addition, wastewater can be recycled.

(9) Projects designed to bring water from sources outside the region, among which would be the Turkish Peace Pipeline, may become necessary in the future. However, this Pipeline would be subject to subsequent arrangements regarding other common sources. In this respect, the quality of the Seyhan and Jeyhan rivers in southern Turkey in addition to the other environmental effects, would be an important factor in planning shared water projects, the adoption of which depends on political considerations.