

Management of Freshwater Resources in Israel and Lebanon

A thesis submitted in fulfillment of the requirements for the
degree of

Doctor of Philosophy

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BA Economics

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February 2009

Declaration

I certify that except where due acknowledgement has been made, the work is that of the author alone; the work has not been submitted previously, in whole or in part, to qualify for any other academic award; the content of the thesis is the result of work which has been carried out since the official commencement date of the approved research program; any editorial work, paid or unpaid, carried out by a third party is acknowledged; and, ethics procedures and guidelines have been followed.

A handwritten signature in black ink, appearing to read 'AGH', is centered on a white rectangular background.

Antoun Gergi Hindy

10/09/2009

Acknowledgments

When asked: Who he had learned his virtues from? Jesus responded:
“I did not learn them from anyone. I looked at others, observed the things I did not like and I avoided doing the same, copying and imitating the things I liked.”

Knowing the path is totally different than walking the path. In every walk we decide to walk there are many obstacles and walls to face, what make us stronger when up again are those positive values that we collect during our life's journey. These virtues represent cushions or "mattresses" that prevent us from crashing when running into these walls and falling to the ground.

I am very thankful to my dedicated and inspiring supervisors for their cooperative supervision and guidance, and I highly appreciate their feedback. Without their constructive attitudes this research would not have been possible.

A special thanks to my supervisor Prof Peter Sheldrake who guided me all the way. I consider myself extremely lucky to have such inspiring supervisor. He supported me during the most challenging times of my research, and opened the door for me in many ways.

Very special thanks to my second supervisor Dr Jonathan Boymal, as without his acceptance at the beginning to my proposal all of this would not be occurring. His support was very enriching and greatly facilitated thinks during my study.

Thanks to Prof Clive Morley for his support and especially his supervision concerning my work with the Graduate School of Business, and to Prof Issam Khalife for his encouragement, I highly appreciate his feedback. Plus I extremely admire Prof Joseph Maalouf, whom I respect for his generous approval, for his work in trying to find common grounds between Christianity, Judaism and Islam.

A special thanks and appreciation to General Michel Aoun for his support and his positive attitude concerning this research, his feedback and his dedication to encouraging peace and ways to build co-operation between the relevant parties in Lebanon and abroad.

The greatest thanks goes to my family, my wife Mirna, my daughter Maria and my son Maroun, as without their understanding and support this could not be

happening. They are my inspiration and my joy. Without them standing by my side and reminding me that there is life besides a PhD, this project would not have been achievable.

The warmest and strongest feelings go to my mother, this thesis is dedicated to her and particularly to my Dad who passed away on the third of August 2000, and I still remember his words:

“My son, in this dark tunnel we are candles, our destiny is showing others the way that we believe is the right one, but in doing so we must melt down in order to give light. Do not complain and be afraid in doing that, as if you don’t care how you love and be loved, if you don’t love how you notice the white dot in this dark picture, if you don’t see the light how can you believe, if you don’t believe how you find inner peace, if you don’t have peace within how you gonna promote peace.”

“When planting hate your crop want be love, at some stage even evil steps aside to allow good to spread again, otherwise and if everything becomes evil the bad /good formula cease to exist, as the norm will be hate.”

“Don’t be concerned and afraid from the future, as when you are equipped with the right tools you are capable to overcome all the obstacles, and you know what to do and what tool/s you have to use.”

Thanks to everyone who believed in me and encouraged aspiration, and gave admiration and support. I consider this study a start of a long and hard journey, and when walking the walk and talking the talk things will become more challenging. Isn’t our purpose in life tackling and handling disturbing issues?

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Part I *Introduction and Research Methodology*

1 Introduction

1.1 Water for Life

Under the United Nations 'Universal Declaration of Human Rights', the principle of life and the dignity of the human person must be the ultimate guiding norm for all development policy, including environmental policy. On this basis, powerful international interests, public and private, one expected to adapt their agendas to serve human needs rather than dominate them.

The availability and quality of freshwater resources around the world is a growing concern to the international community. Despite the academic debate regarding the relationship between water and conflict, it is certain that control of the world's limited freshwater resources will continue to be subject to dispute.

Water is an essential element for life. Water is a primary building block of life. Without water there is no life, yet water, despite its creative role, can destroy. The Bible opens precisely with the image of the divine spirit hovering over the water at the creation of the universe.

In the Judeo-Christian Holy Book, the Bible, God is presented as the source of living water beside which the good man can find life. Because the Bible was written in a part of the world where water is scarce, it is not surprising that water features significantly in its account of the lives of the people. Due to the scarcity of water in the lands of the Scripture, rainfall and an abundance of water was seen as a sign of God's favour and goodness.

In the accounts of creation contained in the first two chapters of the Bible, it is from the midst of the waters that dry land is made to appear, while living reptiles and rich life forms are made to swarm the waters. It is also water that moistens the earth for other forms of life to appear.

The principles of sustainability and of the universal destination of the goods of creation confirms that people and countries, including future generations, underpins the right to fundamental access to those goods which are necessary for their

development. As well as the centrality of the human person, this must be foremost in any consideration of the issues of water. (Walker-Leigh V. 2003)

Worldwide, water demands are increasing, groundwater levels are dropping, water bodies are increasingly contaminated, and delivery and treatment infrastructure is aging. Although wars over water alone have not yet occurred, there is ample evidence showing that the lack of clean freshwater has led to intense political instability and that violence has occasionally been the result. As water quality degrades and quantity diminishes over time, the effect on the stability of a region can be unsettling.

Population growth, a change in consumption habits and a deterioration of water quality in some areas are considered the main reasons leading to water scarcity. Furthermore, the duality between national and environmental system boundaries can cause conflicts. National politics often ignore the fact that people are bound together by shared environmental resources. The water resources for irrigation are finite, upstream actions effect downstream reservoirs and water courses, and droughts have no political boundaries.

Many consider that water has often been used as a strategic target in war, even when water facilities are not targeted; they are often among the first casualties of the violence. International efforts to protect and sustain fresh water have focused primarily on management practices and policies, rather than prevention of the violence and conflict that impacts water supply. Little attention is given to the international legal regimes that are designed to protect fresh water, or the effectiveness of those regimes.

The link between natural resources and national security is becoming increasingly apparent, and in the case of water, discussions have largely focussed on the question of water scarcity and water-stress. These concepts raise visions of a world in which conflicts arise over inadequate water supplies.

Water shortage and the threat of desertification are the major regional challenges facing the countries of the Middle-East in the foreseeable future. The region's water supply depends on fluctuations in rainfall, which is in short supply. The countries in the region also suffer from lack of storage capacity, to regulate the water supply and to bridge over drought and dry cycles.

Lebanon has a wealth of water resources in its numerous rivers, its underground aquifers, and with plentiful rainfall in the winter. The fundamental

problem is that more than half of the rainwater flows unexploited into the sea, accompanied by poor water management. Finding proper solutions should enable Lebanon to meet all its own needs, and be an exporter of hundreds of millions of cubic meters of water to its parched neighbours. Despite the lack of development plans, South Lebanese water resources are of particular political and strategic interest, given they are focussed on the Jordan River Basin and the area around the Golan Heights.

1.2 Region Water Sensitivity

Why does the Middle East dominate the headlines so often? The obvious answer is: Oil. Without oil, the economies of many nations would grind to a halt. The crucial importance of oil alone ensures that the Middle East will remain in the headlines for years.

This dependence on oil has fundamentally altered the Western nations' relationship with the region, transforming it into a strategically vital part of the world. Nations around the world are all affected by what is happening in this volatile region.

As the amount of available freshwater in the world decreases in quantity and quality, protection of this critical resource becomes a matter of international security. In the Middle East fresh water may become as important as oil.

More than anywhere else, the Middle East exemplifies the perils and possibilities created by the water crisis. There is scarcely enough freshwater for the present population of the Jordan Valley as this study will document.

Water is a sensitive issue in the parched Middle East and Arab world. Almost all the five Arab-Israeli wars fought since Israel's establishment in 1948 have touched on water-related issues. For example, Arab attempts to divert the sources of the Jordan River were one of the main factors leading to the 1967 War (LaMotte, 2002).

Gleick (1993) describes water resources as military and political goals, using the Jordan and Nile as examples, and uses case studies from the Middle East, South Asia, and South America as well-known examples of water as a cause of armed conflict. Many list the Jordan River as a principal cause of the 1967 war and describe water as a causal factor in both the 1967 war and the 1982 Israeli invasion of Lebanon (Barrett, 1994).

In fact, in the years since Israel's invasion of Lebanon in 1982, a hydraulic imperative theory, which describes the quest for water resources as the motivator for Israeli military conquests, both in Lebanon in 1979 and 1982 and earlier, in the Golan Heights and West Bank in 1967, was developed in the academic literature and the popular press.

Water-related incidents include the first Arab summit, with the subsequent establishment of the Palestine Liberation Organization (PLO) in 1964, armed escalation between Syria and Israel leading up to the Six-Day War in 1967 and, according to some, the war itself, as well as the current impasse over the final status of the West Bank. Israel's incursions into Lebanon and its continued presence (Chebaa farms and Kfarchuba hills) there have also been linked to a hydraulic imperative.

1.2.1 Historical Snapshot

From the beginning of civilization in the Middle East, the limits and fluctuations of water resources have played a role in shaping political forces and national boundaries. Water availability helped to determine both where and how people lived and influenced the way in which they related to each other. Issues of water conflict and cooperation have become especially intense with the growth of nationalist feelings and populations of the twentieth century.

These issues are also relevant to current conflict, particularly between Israel, Lebanon, Jordan and the Palestinians on the West Bank and Gaza Strip, but they may offer new opportunities for dialogue as well.

Before World War I the Middle East was dominated by the Ottoman Empire, the Ottomans who ruled over all the lands, which form the countries whose names are now so familiar to everyone. Turkey, Lebanon, Syria, Iraq, Jordan, Israel, Kuwait, Saudi Arabia were ruled by this empire. Within this empire different groups lived in relative harmony. About 40% were Turks and 40% Arabs, with the remainder a different ethnic groups; Armenians, Jews, Christians and other.

Things might have continued this way, but at an early stage in World War I, it was not clear which side the Ottomans would support. Both the British and the Germans approached the Turks. Finally the sultan opted to support the German Kaiser, an unwise decision that ultimately led to the birth of many new nations cited previously. One of these nations that eventually came into being was the Jewish state of Israel, complicating the geopolitical situation in the region.

1.2.2 The Jewish state of Israel and water

Relations between the Arabs and the Israelis concerning water in the years after the establishment of Israel were marked by a “proposal-disagreement” scheme. As an example, Eric Johnston’s efforts to settle the water issue in the mid-50s failed, mostly because as long as the Arabs accepted a plan, Israel would reject it because it wasn’t granted access to the Litani waters. And the other way round, the Arabs couldn’t say yes to a proposal and decide for example on the Litani due to political reasons. This situation did not bring about agreements, but rather increased the pressure on both parties.

At the end of the 19th century Jewish strategic planners already realized the importance of water while making the first plans for a new state of Israel. Jewish leaders after World War I considered it necessary to extend the plans for Israel to important sources in order to keep Israel economically viable (Sabbagh 1994, p. 505). The Sea of Galilee, the Yarmouk River, the Golan Heights and the Litani River were, among other landmarks, supposed to mark the natural border in the north.

After the San-Remo accord in 1920, which decided on the former territories of the Ottoman Empire, Chaim Weizman (Chairman of the World Zionist Organization), who later became Israel’s first president, wrote to the British Foreign Secretary, Lord Curzon (George Nathaniel Curzon, first Marquess Curzon of Kedleston, 11 January 1859 – 20 March 1925, was a British Conservative statesman who served as Viceroy of India between 1899 and 1905, and Foreign Secretary between 1919 and 1924):

... The accord draft France proposed not only separates Palestine from the Litani River, but also deprives Palestine from the Jordan River sources, the east coast of the Sea of Galilee and the entire Yarmouk valley north of the Sykes-Picot line. I am quite sure you are aware of the expected bad future the Jewish national home would face when that proposal is carried out. You also know the great importance of the Litani River, the Jordan River with its tributaries, and the Yarmouk River for Palestine. (Eickelpasch, T. 2007)

He wrote also to the British Minister David George (David Lloyd George, first Earl Lloyd-George of Dwyfor, 17 January 1863 – 26 March 1945, was a British statesman and the only Welsh Prime Minister of the United Kingdom. He was Prime Minister throughout the latter half of World War I and the first four years of the subsequent peace, between 1916 and 1922), describing the minimum requirements of a Jewish State, stating that:

The whole economic future of Palestine is dependent upon its water supply for irrigation and for electric power, and the water supply must mainly be derived from the slopes of Mount Hermon, from the headwaters of the Jordan and from the Litani River in Lebanon ... We consider it essential that the Northern Frontier of Palestine should include the Valley of the Litani, for a distance of about 25 miles above the bend, and the Western and Southern slopes of Mount Hermon. (Isaac, J. and Hosh, L. 1992)

The Zionist movement, however, faced opposition by the French and was not able to extend the borders and reach the Litani River. (Eickelpasch, T. 2007)

During World War II and its aftermath, investigations and assessments of the regions' resources continued. For example in 1939 Ionide and Hayes published their plans, followed by Lowdermilk in 1944, Klab in 1949 and McDonald in 1950. Of these plans the Lowdermilk plan caught great attention and was considered the 'water constitution' by the Jewish. Lowdermilk proposed to use the Dan, Zarqa, Baniyas, Yarmouk and the Hasbani River in Lebanon as contributors to irrigate the Jordan Valley. Furthermore, it was suggested that the Litani River should make up an artificial lake in northern Palestine from where water could be pumped to the Negev Desert in South Palestine. Lowdermilk's plan failed in the end because Eric Johnston in the 1950s, then a special envoy to the Middle East of President Eisenhower's US administration, denied the use of half the flow or more of the Litani River. Nonetheless, the Lebanese waters in the South were of interest to the Israelis for their purity and surplus (Kolars/Naff, 1993).

At the end of World War II the situation became even more complicated. The new state of Israel was about to come into being and the water needs of the native Palestinians and the increasing numbers of immigrating Jews had to be satisfied. Besides, the latter were (and to a certain extent are still) not necessarily used to water scarcity.

David Ben Gurion proclaimed Israel as a new sovereign state on May 14, 1948. The Zionist movement, led by their ideology and motto "*to make the desert (Negev) bloom*", abandoned further plans of regional development. After a period of bargaining for water from 1918 until 1948, Israel began to develop national and shared water resources.

After 1948 Israel was, due to its growing military power, able to annex more and more territories. Despite the already mentioned ideological background, Israel

thought strategically and practically that obtaining a greater territory promised more access to water, which again allowed Jewish farmers to produce better and larger crops. Increased agricultural production resulted in a higher capacity for absorption of Jewish immigrants to Palestine. And Palestinian farmers, who could not keep up with the more advanced Israeli production, ended up in bankruptcy and “had no other choice than sell their land to always-ready-to-buy Zionists”. (Sabbagh 1994, p. 507)

The foundation of this strategy is not only the acquisition of land, which was solvable through military dominance, but also the availability of water. Without it, the developmental circle was at stake. This explains why since 1948 and particularly after 1967 Israel had confiscated and controlled most of the Arab lands and water resources under the title of security reasons or security needs.

Mr. Y. Shamir, Prime Minister of Israel in 1990, summarized this policy in the sentence: “*Great Aliya (immigration) needs great Israel*”. This means that great immigration needs all water resources in the occupied territories to still are under the control of Israel. On the same principle “*Aliya in the future needs new water resources and new lands, otherwise Israel will be in a water crisis!*” (ibid. p. 513)

Earlier Moshe Sharett, Israeli Foreign Minister at the time, said:

“All those wishing to win our cooperation in this sphere must realize one thing. For Israel, water is no luxury, not even merely a highly desirable and useful addition to our system of natural resources. Water for us is life itself. It is food for the people and not food alone.” (Sharett, 1953)

The diaries of Moshe Sharett, Prime Minister of Israel in the mid-1950s, reveal that David Ben-Gurion (the first Prime Minister of Israel), and Moshe Dayan (Israel’s chief of Staff and later Defence Minister) were strong advocates of an Israeli occupation of southern Lebanon up to the Litani River. Sharett quotes Dayan as having said in 1954:

“... The only thing that’s necessary is to find an (Lebanese) officer, even just a Major. We should either win his heart or buy him with money, to make him agree to declare himself the saviour of the (Christian) Maronite population. Then the Israeli army will enter Lebanon, will occupy the necessary territory, and will create a Christian regime which will ally itself with Israel. The territory from the Litani southward will be totally annexed to Israel and everything will be all right”. (See appendix 2, annex 2)

Both Chaim Weizman (Head of the World Zionist Organization) and David Ben Gurion claimed the Litani Basin as part of Israel's ancestral rights. Additionally, Moshe Dayan was a long-time advocate of Israeli sovereignty over the Litani. Since the water has continued to play a key role in Israeli history. For example in the 1960s Israeli warplanes bombed a Jordanian dam project on the nearby Yarmuk River, a tributary of the Jordan. The hydraulic imperative theory noted earlier, was seen to explain the quest for water resources as the motivator for Israeli military conquests, both in Lebanon in 1979 and 1982 and earlier, on the Golan Heights and West Bank in 1967.

The May 1991 issue of *Geographical* magazine ran a series of articles related to "water wars" and hydro-politics, including a piece on the Middle East, "where conditions for water-related tension are perfect". Authors writing in this vein cite the importance of aridity, internationally shared rivers, rapid population growth, and unfriendly political relations among the riparian states. Aridity and population growth appear often as key contributors to potential water wars, in a modified form of environmental determinism, which conceptualizes that environmental factors strongly influence human actions. In a similar fashion, other articles such as "Where Dams Cause Wars" link water development projects in the region with the potential for violent conflict. In 2002 Israel threatened Lebanon with war if it completed a project on the Wazzani, a tributary of the Hasbani River that flows into the Sea of Galilee, Israel's main water supply. Lebanon claimed that it could not use the Litani River as a water supply because it is too polluted. (Yoffe and Wolf. 2002)

1.3 An alternative to conflict

On April 1998 a workshop on Middle Eastern water problems was held in Nicosia, Cyprus, organized by an institute affiliated with the University of California at San Diego. The mission of the institute and the workshop was to search for solutions to regional conflicts, based on scientific research and meetings between scientists from both sides of the national divide. Researchers, engineers, politicians and managers, from the U.S.A., Israel, the Palestinian Authority, and Jordan, participated in the workshop. (Prof Issar. 1998)

After preliminary statements, the Palestinian representative said that, in accord with the Oslo agreements, in which Israel recognizes the rights of the Palestinians to domestic water supplies, and on the basis of predicted population

increase and rising standards of living, the Authority requests permission to draw on water from the Uplands Aquifer for the next decade at a rate of 200 Million Cubic Meters per year (Mm^3/yr), and within 20 years, 400 Mm^3/yr . The Palestinians request was strongly opposed, on the grounds that this water is about one third of the overall water usage of the State of Israel.

To replace this source, Israel would have to desalinate sea water-meaning an annual loss of \$200 million, even rising to \$400 million later on. The American intermediary proposed an economic compromise. He noted that Israel's GNP reaches some \$100 billion, so that \$200-400 million represents only 0.2 to 0.4% of GNP. He noted that the sum lost by Israel through the theft of motor vehicles and their smuggling over the border, reached some \$400 million per year, and proposed that the Palestinian Authority takes steps to stop the theft; the U.S.A. offered Israel low cost credit to start construction of a desalination plant to produce 200 Mm^3/yr . When the plant commenced production, Israel would allow the Palestinians to draw this amount of water from the Uplands Aquifer. In the first stage, Israel would gain \$200 million/year, and in the future, when the Palestinians would want to pump the full amount, the two sides would enter fresh negotiations. The Palestinian agreed, but claimed that since the border between Israel and the Autonomy was highly convoluted, the Palestinian police would be unable to close it off to the smuggling of vehicles. The only way would be to shorten the border by the dismantling of isolated Jewish settlements stuck in the middle of the Arab population. The Israeli stated that the settlements were important for security and defense of the water sources. The Palestinian replied that their removal and the resultant shortening of the border would also improve Israel's security. Thus, the debate slid into a well known weary pattern. (Ibid. 1998)

When the Centre for Strategic Studies at Tel Aviv University completed a major research project on the implications of a complete withdrawal from the Occupied Territories for Israel in early 1992, publication of the report was censored by the director of the Israeli Water authority and the then Minister of Agriculture, Rafael Eitan. Eitan reportedly said that it was not the business of an academic study to define a territorial settlement in the region. The study demonstrated that even with complete withdrawal from the Occupied Territories, Israel would still be able to prosper with adequate water supplies. The former director of the Israeli Water Authority, Kentor Cohen, believed it was "strange" that the military censors would

have a problem with the report, noting that “... *people who say that Israel cannot return the occupied territories because of water are politicians not experts in water issues ... The experts don't say that.*” (Ibid. 1998)

The Jordan River basin includes portions of Israel, Jordan, Syria, Lebanon and the Palestinian Territories (the West Bank and Gaza Strip). Through military action in the Arab-Israel wars of 1967 and 1973, Israel has come to control a significant part of the basin, leaving water-short Jordan in a vulnerable position. In October 1994 the political situation in the region changed and Israel and Jordan signed a Peace Accord. As part of this treaty, Israel promised to provide an additional 50 million cubic meters (Mm^3) water a year to its Arab neighbour. Israel's commitment to supply Jordan with extra water is now considered fixed, since any deviation from the agreement will aggravate the already acute water shortage in the Hashemite Kingdom.

The water-related part of the 1994 treaty is especially significant because it opens the door to increased cooperation in water matters between two traditionally hostile countries. However, Israel and Jordan continue to disagree over the implementation of the treaty.

Under the Oslo agreement of 1995, Israel allowed Palestinians in the West Bank to abstract up to 80 million cubic meters a year (Mm^3/yr). From the western aquifer, recognizing for the first time that the Palestinians have legitimate water rights in the West Bank.

1.4 Research Goals

After examining the availability of water resources, limited co-operation and water use and management in Israel and Lebanon, the aim of this research is to identify issues in the disputes that have arisen, to explore some alternative scenarios that could lead to the solution of the complex problems related to water supply, and to recommend processes through which the countries concerned are likely to agree to mutually satisfactory solutions to the problems.

This thesis explores how the effective management of water resources in Israel and Lebanon can provide domestic and regional benefits, and examines whether an economic framework can assist such effective management. Instead of considering water as a cause of political tension and even of armed conflict, is it possible to be promoted as a ‘vital element’ toward peace?

This thesis considers whether there is some possibility for ‘mutually advantageous bargaining and exchange’ between Lebanon and its neighbours, especially Israel, over water resources, that might prevent future conflicts over this contentious issue. The intersection between cultural-values (religions background), science and development, is discussed.

This Thesis explores the following questions:

- a. Is there a water “problem” between Israel and Lebanon?
- b. Given that most conventions and treaties were designed to cover conflicts of an international character, and that the concept of war is changing, and the term is used more often today in the international war against terrorism, does the existing body of laws provide an adequate degree of protection, and is there any weakness in the existing ones?
- c. Can economic considerations alone provide an acceptable solution to water allocation problems?
- d. Could mutually advantageous bargaining over water have wider implications for peace between the relevant countries?
- e. Can religion contribute to a satisfactory solution to water allocation problems?

1.5 Thesis outline and structure

This thesis is structured as follows:

First Part: This part includes Chapter two, which is divided in two sections: the introductory section explores the thesis goals and objectives. The second section highlights the methodology, methods that are chosen, and the reasons for these choices.

Second Part: Freshwater resources status and availability, water allocation and water management, main freshwater problems as well as present and future policy plan towards conservation, use efficiency and water quality, are discussed in depth in this part, which comprises chapters three (Israel) and four (Lebanon).

Third Part: This part includes the fifth chapter (Political, Legal, Economic and Religious issues in water allocation), which considers the present state of water under international law, current problems and weaknesses in existing law, and outlines principles of customary law and the existing international conventions and protocols in this area. This section focuses on the relationship between water and conflicts, and tries to answer the question of adequacy of protection and weakness in

the existing law. Furthermore, it examines the relationship between water scarcity, availability and conflicts.

After explaining the relationship between Externalities, Property Rights and Economic Efficiency models (Efficiency in Exchange, and Efficient Allocations), this section explores the role of strategic behaviour and bargaining strategy, and discusses the potential gains to cooperation and international agreements. It finally highlights the role of some key religions in this matter; the Islamic point of view (based on *Shari'a*), the Vatican's position, and the Jewish perspective.

This part also contains Chapter 6, which includes a case study showing that despite an existing conflict between two parties, there is a high probability of reaching an understanding and/or an agreement. This is achievable, in particular, when the limits and fluctuations of water resources play a role in shaping political forces and national boundaries, and when the issue of water availability determines both where and how people live and influences the way in which they relate to each other.

Furthermore, this part contains chapter 7 which highlights the different perspectives that can be of high value in the contribution to the solution model (road map) that being developed in chapter 8.

Fourth Part: After highlighting in brief the lessons learned from previous chapter 6, and taking into consideration the discussions and the different points of view mentioned in chapter 7, chapter 8 (Managing Water Resources, Co-operation or Conflict) discusses the importance of co-operation by working towards finding common grounds between the concerned parties, starting with:

- Firstly, by recognizing the religious-cultural, and values system background of each group;
- Secondly, by examining whether the paradigms used for negotiations are “rights-based” or “needs-based”;
- Thirdly, by showing that economic consideration alone may not provide an acceptable solution to water allocation problems, especially to solve water allocation disputes between concerned nations;
- Finally, by acknowledging the raised issues, this study concludes by the identification of common denominators, which should be considered as a stepping stone to another level of in-depth discussions and negotiations between the relevant countries.

2 Methodological Aspects

2.1 Introduction

From case studies to econometric analysis, policy research has a long tradition of employing both qualitative and quantitative methods, but the usual apposition of qualitative research against quantitative research makes it easy to miss the fact that qualitative research itself covers a multitude of different approaches.

Qualitative work can be positivist: It can attempt to document practices that lead consistently to one set of outcomes rather than another, to identify characteristics that commonly are related to some policy problem, or to find strategic patterns that hold across different venues and with different actors. Qualitative work also can be interpretive: It can seek to understand what general concepts like poverty or race mean in their specific operation, to uncover the conscious and unconscious explanations people have for what they do or believe, or to capture and reproduce a particular time, culture, or place so that actions people take become understandable.

Understanding the fundamental assumptions behind a research is essential in order to justify the methodologies and methods to be employed in the research design. Justification of the methodological choice should relate to the theoretical perspective that underpins the research (Crotty, 1998). This study is therefore structured into three main measures:

- Analyses of the assessment of freshwater resources in Israel, Lebanon and the Palestinians' territories (West Bank and the Gaza Strip);
- Assessing the international law position, the socio-economic perspective and the culture-religions consideration;
- An analysis of the state of conflict or co-operation between parties.

2.2 Research Paradigm

There are two main research paradigms or philosophies which can be labelled positivist and phenomenological. The first give greater priority to the external reality, facts and linear causality; the latter gives greater priority to meanings, inter-linkages and understand reality as something that is constructed by the observer and involved actors.

When the research's goal is to develop a conceptual model for the purpose of building theory around a particular phenomenon or process, an interpretive approach (phenomenological) utilising a qualitative methodology is more appropriate. However, if the primary goal of the research problem is to test the validity of a model where all the variables which influence a phenomenon or process are already known, then a quantitative methodology (positivist) may be more appropriate.

In fact, different kind of terminology are used in describing these two terms, table 2.2.a shows alternative terms for the main research paradigms.

Table 2.2.a

<u>Positivist Paradigm</u>	<u>Phenomenological Paradigm</u>
<i>Quantitative</i>	<i>Qualitative</i>
<i>Objectivist</i>	<i>Subjectivist</i>
<i>Scientific</i>	<i>Humanistic</i>
<i>Experimentalist</i>	<i>Interpretivist</i>
<i>Traditionalist</i>	

Source: Adapted from Collis J. and Hussey R. (2003) p. 47.

Qualitative research methodology is not suited for all research problems, and one must take into account the research goals as well as the research philosophy and epistemology driving the research. In situations where a review of the extant literature does not reveal significant attempts at constructing a theoretical model of a phenomenon, the researcher may wish to take an alternative research approach to the more traditional quantitative techniques in order to uncover concepts and construct a conceptual model and build theory within a specific context.

Positivists believe that science and the process of research is value-free. Therefore, positivists consider that they are detached from what they are researching and regard the phenomena which are the focus of their research as objects. Positivists are interested in the interrelationship of the objects they are studying and believe that these objects were present before they took an interest in them. Furthermore, positivists believe that the objects they are studying are unaffected by their research activities and will still be present after the study has been completed. These assumptions are commonly found in research studies in the natural sciences,

but they are less convincing in the social sciences which are concerned with the activities and behaviour of people. (Collis, J. and Hussey, R. 2003)

At the other extreme, phenomenologists consider that researchers have values, even if they don't show them. These values help to determine what are recognised as facts and the interpretations which are drawn from them. They believe that the researcher is involved with that which is being researched. Furthermore the main criticisms of the positivistic paradigm are (ibid. 2003):

- a.** It is impossible to treat people as being separate from their social contexts and they cannot be understood without examining the perceptions they have of their own activities.
- b.** A highly structured research imposes certain constraints on the results and may ignore more relevant and interesting findings.
- c.** Researchers are not objective, but part of what they observe. They bring their own interests and values to the research.
- d.** Capturing complex phenomena in a single measure is, at best, misleading. For example, is it possible to assign a numerical value to a person's intelligence?

Table 2.2.b Features of the two paradigms

<u>Positivistic paradigm</u>	<u>Phenomenological paradigm</u>
<i>Tends to produce quantitative data</i>	<i>Tends to produce qualitative data</i>
<i>Uses large samples</i>	<i>Uses small samples</i>
<i>Concerned with hypothesis testing</i>	<i>Concerned with generating theories</i>
<i>Data is highly specific and precise</i>	<i>Data is rich and subjective</i>
<i>The location is artificial</i>	<i>The location is natural</i>
<i>Reliability is high</i>	<i>Reliability is low</i>
<i>Validity is low</i>	<i>Validity is high</i>
<i>Generalises from sample to population</i>	<i>Generalises from one setting to another</i>

Source: Adapted from Collis, J. and Hussey, R. 2003, pp.55.

Table 2.2.b shows the main features of the two paradigms. It is important to mention in this context that the type of methodology should reflect the assumptions of the research paradigm. For example, an experiment conducted in a laboratory to measure the productivity of workers where the temperature of the room is

deliberately varied would be positivistic. However, some methodologies can be used under either a positivistic or a phenomenological paradigm, depending on the assumptions used by the researcher.

2.4 Research Approach

Approach, strategy and method are hierarchically dependent on each other. There are two basic research approaches (positivist and phenomenological) within which different research strategies are used, each strategy makes use of different or all research techniques.

Two types of case studies were conducted in this research; the Johnston Negotiations, and the Yarmouk River negotiations. Using existing literature, the development and effectiveness were analysed in chapter 5, which considers the present state of water under international law, current problems and weaknesses in existing law, and outlines principles of customary law and the existing international conventions and the relevant protocols in this area.

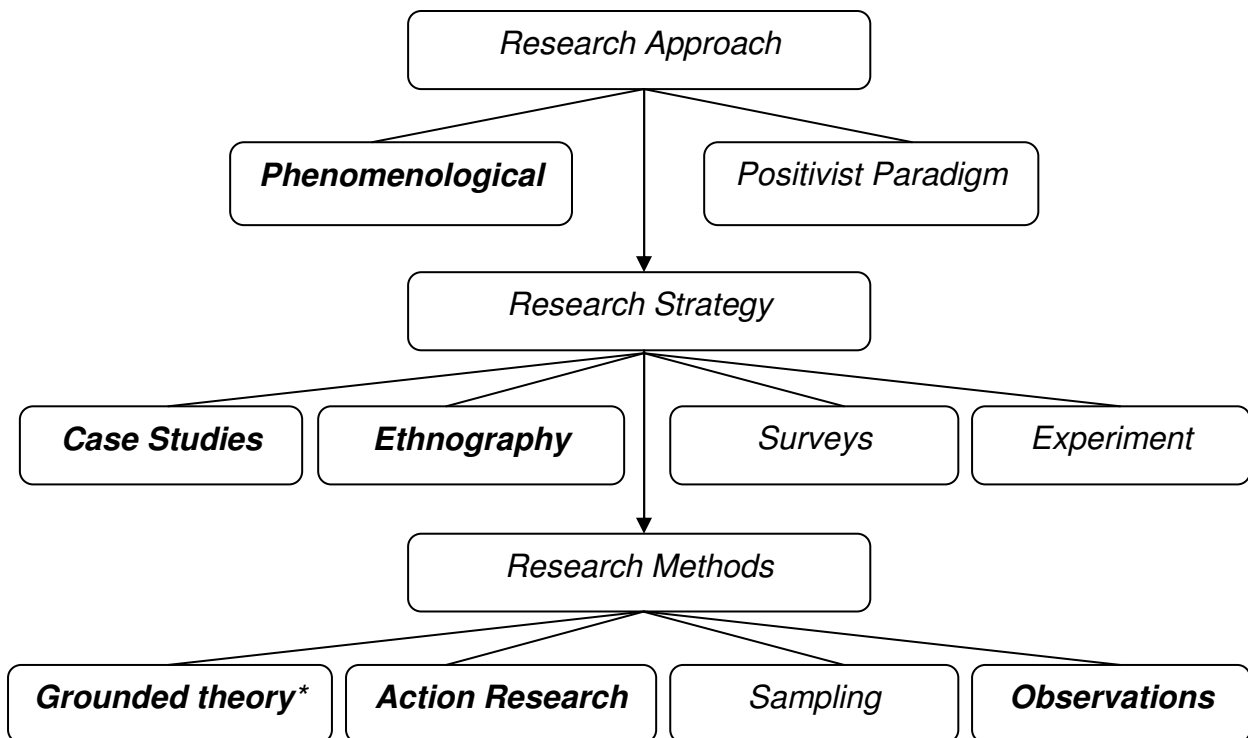
This research then shows in chapter 5 the role of strategic behaviour and bargaining strategy, and discusses the potential gains to cooperation and to international agreements ending by explaining the role of religion in this matter; the Islamic point of view, which is based on *Shari'a*, the Vatican's position, and the Jewish perspective.

The main purpose was to test the working hypotheses and reach the third objective of the research: the identification of general lessons on conflict prevention/resolution and cooperation. Each new case study gave rise to some modifications or additions to the set of hypotheses. This new set then formed the starting point for the next case study. The end results are the lessons learned in section 8.4 and the key messages presented in section 8.5 in chapter 8 of this study.

Diagram 2.4.1 summarizes the different levels of the research approach, strategy and research technique or method. In order to position this study in the context of social and natural science approach, the approaches, strategies and techniques used in this study are marked in bold. As the study progressed, the phenomenological approach became increasingly significant.

This research uses a case study strategy as a start and for the next stage uses elements of action research in the form of Dialogue Workshop.

Diagram 2.4.1



Source: Adapted from Mason, 2004

Case Study Method:

The case study is an extensive examination of a single instance of a phenomenon of interest and is an example of a phenomenological methodology.

The case study method investigates a phenomenon within its real-life context, where multiple sources of evidence are used to construct or inform the phenomenon. One of the decisions that the researcher must make using this method should take into consideration whether to conduct a single case or multiple cases.

Although a case study approach is a very satisfying methodology, there are some weaknesses. Access to suitable information is sometimes difficult and the process can be very time consuming, as confronted in this study when collecting information particularly about Lebanon in chapter four.

The strategy used in this research belongs to the category of in-depth case studies which is discussed in chapter six.

Ethnography

Ethnography is an approach in which the researcher uses socially acquired and shared knowledge to understand the observed patterns of human activity. The researcher can obtain firsthand experience of the context being studied, and better

understand and interpret the phenomena being examined. This is exactly what happened during the making of chapter five especially section 5.6.

On the other hand when conducting ethnographical studies a number of problems the researcher faces; the issue of whether the particular setting or group reflects the research interest and whether it will be possible to generalise from the findings.

Action Research

Action research is the approach which assumes that the social world is constantly changing. It is a type of applied research designed to find an effective way of bringing about a conscious change in a partly controlled environment (*Collis J. and Hussey R., 2003*).

Accordingly, this thesis tries to highlight two of the characteristics that cope with this type of research:

- The investigation of the whole complex problem;
- Taking into consideration the fact that the action research is primarily applicable to the understanding and planning of change in social systems.

In addition, the methodology used in this research should not be judged solely by the criteria used for the positivistic paradigm, but by a criterion more appropriate.

Grounded Theory and Observations

Grounded theory is an approach for looking systematically at qualitative data aiming at the generation of theory. Sometimes, grounded theory is seen as a qualitative method, but grounded theory reaches further: it combines a specific style of research (or a paradigm) with pragmatic theory of action and with some methodological guidelines (wikipedia.org, 2008).

The grounded theory approach is the only part which could not be in-depth tackled during this research, actually in chapter 7 this thesis showed different perspectives, which can be considered as observations. These points of views consist of personal comments, opinions and discussions based on meetings and discussions with key figures in Lebanon during different visits to Lebanon between 2006 and 2008, especially after the armed conflict that took place in July 2006 between Israel and Lebanon.

This research opens the way for another level of discussions, by taking into account the elements cited in this chapter and in this thesis as a whole, particularly

in chapter eight, in order to be used basically during a brain storming approach in the proposed future Workshops' Dialogue.

Part II *Freshwater Resources in Israel and Lebanon; Facts and Availability*

3 *Israel*

“For Israel, water is no luxury, not even merely a highly desirable and useful addition to our system of natural resources. Water for us is life itself. It is food for the people and not food alone...” (Sharett M., 1953, see appendix 2, annex 2)

3.1 Introduction

The State of Israel is a country in the Western Asian Levant, on the south-eastern edge of the Mediterranean Sea. It borders Lebanon on the north, Syria and Jordan on the east, and Egypt on the south-west (see appendix 2, Annex 1, Fig. 1).

Israel is one of the most densely populated countries in the world, and yet only 20% of the land is arable, and half of that has to be irrigated. More than half of Israel is arid or semi-arid, and steep hillsides and forests dominate the rest of the country. Israel also has striking rainfall inequalities, while the north of the country enjoys a relatively generous rainfall between 700 and 1000 millimetres each year, the central region receives around 500 millimetres and the south only 25-30 millimetres annually.

Israel is an arid country, with the desert occupying more than 50% of its land area. Similar conditions exist in other countries in the region. Israel has a surface area of about 20,770 km² and a population of about 6.3 million. Annual rainfall ranges from nearly 1,000 mm in the north to 30 mm in the south, and nearly all of it falls within the four-month period from November through February, with quantities fluctuating from year to year.

Due to global warming and frequent droughts, the regime of the natural flows is decreasing despite the limits on water withdrawal. At the same time, the inflow of pollutants from human activity and negligence above the aquifers is increasing, resulting in the increase of mineral and other pollutants in the groundwater. Due to unbalanced exploitation and return flow from irrigation, an increase in the salinity of the groundwater has occurred in many wells.

Today, all obvious feasible resources are exploited, including springs, groundwater reservoirs, aquifers and the Jordan River system. At the same time, as a result of accelerated population, industrial and agricultural growth, the coastal aquifer has been increasingly threatened by contamination from chemical and microbial pollutants, salinity, nitrates, heavy metals, fuels and toxic organic compounds.

3.2 Israel Freshwater

Annual water availability is estimated at approximately 2,000 million cubic meters per year (Mm^3/yr), of which about 1,600 Mm^3 is potable water and the rest is brackish and other marginal water sources. Both water resource development and consumption have grown rapidly since the establishment of the State of Israel in 1948. (IMFA 2002)

The depletion of the country's main water sources is worsened by the deteriorating quality of water resources due to demographic, industrial and agricultural pressures and to overexploitation of the country's water reservoirs beyond the natural replenishment rate.

Israel's total water consumption today stands at around 1,850 Mm^3 of water per year. Water demand and consumption are increasing, exceeding the capacity of the natural sources, which are being depleted. Water quality in the sources is deteriorating, due to over-exploitation and intensive human activity. In 1997, the quantity stored in reservoirs was 1,000 Mm^3 compared to the average supply of 1,800 Mm^3 within the "green line" boundaries (1967 borders) and 2,100 Mm^3 between the Jordan River and the Mediterranean. (Keren Kayemeth LeYisrael-Jewish National Fund (KKL-JNF), 2008)

According to the UN water index, Israel suffers from a severe water shortage. UN criteria define the minimum quantity of water necessary as 500 cubic meters per person per year. Israel's water sources can supply only 200 cubic meters per year, only 40% of what the UN considers minimal. By the year 2020 the population of Israel is expected to have grown by another three million. This means that the country will require another 300 Mm^3 of drinking water in order to cope with this population growth and the ever-rising standard of living. (ibid, 2008)

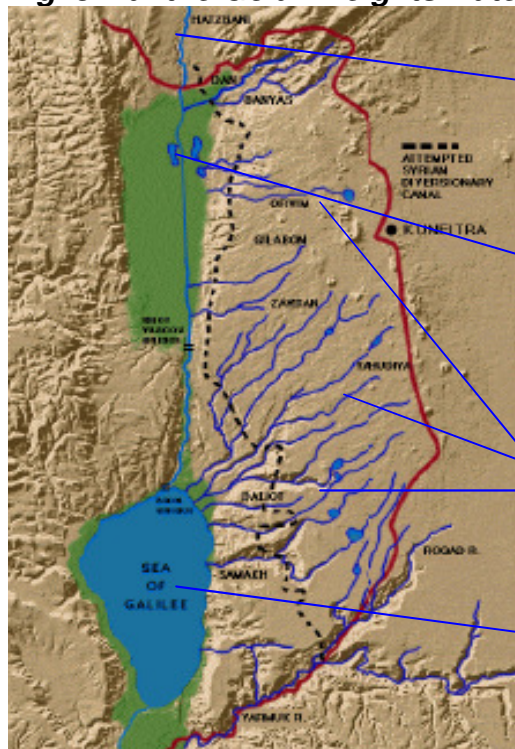
The total average annual potential of renewable water amounts to some 1,800 Mm^3 , of which about 95% is already exploited and used for domestic consumption

and irrigation. About 80% of the water potential is in the north of the country and only 20% in the south. The amount of water consumed is greater than the amount of water collected from rainfall. In a drought year, the situation worsens, because the amount of water in reservoirs and the amount of water flowing in rivers and streams is significantly decreased. (ibid, 2008)

3.2.1 Freshwater resources (See Appendix 2, Annex 1, Map 4)

Israel gets most of its fresh water from three sources: Lake Kinneret (see Appendices 2, annex 3, parts a and b) otherwise known as the Sea of Galilee (figure 3.2.a): the Coastal Aquifer along the coastal plain of the Mediterranean Sea; and the Mountain Aquifer, under the central north-south (Carmel) mountain range. Additional smaller regional resources are located in the Upper Galilee, Western Galilee, Beit Shean Valley, Jordan Valley, the Dead Sea Rift, the Negev and the Arava. In addition, it has made increasing use of recycled sewage water, amounting to 453 Mm³/year. (IMFA 2002)

Fig. 3.2.a: the Golan Heights water surface and the Sea of Galilee



The Hasbani is a Lebanese river that merges with the Dan and the Baniyas River to make the Jordan River. This river flows from the Wazzani source at the foot of Mount Hermon.

In Northern Israel near kibbutz Sede Nehemya, the Upper Jordan River drops rapidly in a 75 km run to swampy Lake Hula, which is slightly below sea level in the Galilee sea area.

Golan Heights, Water Surface.

Lake Kinneret or the Sea of Galilee is Israel's largest freshwater lake. It is approximately 53 km (33 miles) in circumference, about 21 km (13 miles) long, and 13 km (8 miles) wide; it has a total area of 166 km², and a maximum depth of approximately 43 m.

Source: <http://www.d-n-i.net>, 2007

One third of the sewage water is treated and used for irrigation, mainly in the arid Negev region, where agricultural land in the centre of the country gives way to urban sprawl (International Development Research Centre (IDRC), 2008).

About one-third of the State of Israel's national water consumption, some 600 Mm³/year, of water is generated from the Upper Cretaceous aquifers (often referred to as the Mountain Aquifer) that are recharged along the axial part of the Samarian-Judean Anticlinorium running along the north-south direction through most of the West Bank territory.

Table 3.2.a: Groundwater balance for the seven major basins (2000/2001)

<i>Description Basin</i>	<i>Total water extraction⁽¹⁾</i>	<i>Artificial recharge</i>	<i>Total spring flow⁽²⁾</i>	<i>Yield⁽³⁾</i>	<i>Long term average replenishment</i>
<i>Coastal Aquifer</i>	476	122	0	476	283
<i>Yarqon- Taninim</i>	374	0	20	394	350
<i>Western Galilee</i>	96	0	12	108	153
<i>Mount Carmel</i>	35	0	3	38	47
<i>Kinneret</i>	62	0	276	338	580
<i>Eastern Mountain</i>	149	0	190	339	367
<i>Negev and Arava</i>	85	0	0	85	55
<i>Total</i>	1277	122	501	1778	1835

Source: SEMIDE/EMWIS Water context, 2002

Notes: (1) Include Saline water extraction.

(2) Include Saline spring flow.

(3) Total water extraction + Total spring flow.

Table 3.2.a shows the seven major groundwater basins in Israel (noting, no current figures) Groundwater recharged along the high ridges of the "Anticlinorium axis" diverges into three directions along the structural slopes.

To the west the Turonian-Cenomanian aquifer (also called Western Basin or Yarqon-Tannimin Aquifer) towards the Coastal Plain, to the east (Eastern Basin) towards the Jordan-Dead Sea through, and to the north (North-eastern Basin) draining towards Valley of Jezreel (Esdraelon) and Beit Shean Valley (see Appendix 2, annex 3, part c, d and e).

3.2.1 Water distribution

A Government-owned company called Mekorot Water Company (Ltd) is considered as Israel's national water company.

Table 3.2.b Facts and Figures

Annual water supply	1,500 Mm ³ (70% of national consumption and 80% of drinking water) Wastewater reuse: 60% of treated wastewater Sewage treatment: 40% of overall sewage
Customers	4,800 municipalities, local councils, agriculture settlements, kibbutzim and regional associations, who in turn supply water to Israel's citizens, farmers and industries
Employees	2,150
Founded	1937
Ownership	Fully owned by the State of Israel
Financial information	Sales: more than US\$ 700 million per year Shareholders' equity: US\$ 500 million Balance sheet total: more than US\$ 3 billion
Physical plant	Production and supply facilities: 3,000 Control centres: 8 Water pipes: 10,500 Kilometres (Km) Desalination plants: 31. A 100 Mm ³ /yr seawater desalination plants is under construction in Ashdod that will be operational in 2011. Sewage treatment plants: 6 Reused wastewater projects: 10 Filtration plants: 8. Including a 500 Mm ³ /yr filtration plant company's Eshkol facility Pumping units: 1,822 Pumping stations: 659 Reservoirs: 91 Wells: 1,042 Tanks: 637 (500 m ³ and above) Reclamation projects: 10 Water quality laboratories: 6
Water testing	Water samples taken: 40,000 annually Laboratory analysis: 190,000 annually

Source: Adopted from Mekorot, 2008

Table 3.2.b shows the company figures and facts as of 31/12/2006. Founded in 1937, its objective is to develop the country's water supply systems. Mekorot is the national water authority under the Water Law, 1959, and operates the nationwide water system, which includes the National Water Carrier. It is responsible for managing the country's water resources, developing new sources and ensuring regular delivery of water to all localities for all purposes. Mekorot is in charge of the wholesale supply of water to urban communities, industries and agricultural users. Mekorot produces and supplies about two-thirds of the total amount of water used in Israel. The remainder is provided through privately owned facilities. (Mekorot, 2008)

3.2.2 The National Water Carrier

Commissioned in 1964, the National Water Carrier (Figure 3.2.b) represents most of the country's fresh water resources. The shortage of water in the southern, semi-arid region of Israel required the construction of an extensive water-delivery system that supplies water to this region from resources in the north.

The National Water Carrier supplies a blend of surface and groundwater. Water not required by consumers is recharged into the aquifer through spreading basins and dual-purpose wells. Recharging of aquifers helps to prevent evaporation losses, in the coastal area, and intrusion of seawater.

The main function of the Carrier is to convey water to the southern region of the country from the Sea of Galilee (Hebrew, Yam Kinneret, and Lake Kinneret) in the north. The original plan was to draw water from the Jordan River before it entered the lake.

The first stages of the groundwork began in 1953. However, because of strong opposition by Syria and a United Nations resolution, Israel was forced to suspend work and modify the initial design. The final plans were approved in 1956, and the National Water Carrier was completed and functioning by 1964.

The Carrier is a combination of underground pipelines, open canals, interim reservoirs and tunnels. Water from the lake is lifted by the Sapir Pumping Station ($4 \times 6.75 \text{ m}^3/\text{sec}$) from -213 to +44 meters, discharging via an open canal (Jordan Canal), along 17 km into the Tsalmon Reservoir (1 Mm^3). From there, the Tsalmon Pumping Station lifts the water from +37 to 152 meters through Yaakov Tunnel (850 m long), into Bet Natufa Canal (17 km long), and discharges it into the Eshkol Reservoirs. (Dr. Sitton D. 2002)

Fig. 3.2.b: Israel's National Water Carrier



Source: Sitton D. 2003

At the Eshkol site, the canal widens to form a settling basin with a volume of 1.2 Mm³ (600x500x4.5 m) and a reservoir with a storage volume of 3.8 Mm³. From the reservoir, water flows into the National Carrier made of a closed 108" pipeline

laid over a distance of 86 km, branching near Rosh Haayin into two Yarkon branches (66" and 70") until it reaches Mitzpe Ramon, 280 kilometers south of Lake Kinneret.

In addition to the Sea of Galilee, two large aquifers, the Mountain Aquifer and the Coastal Aquifer, contribute some 350 Mm³ and 250 Mm³ respectively, to the National Water Carrier each year. The National Water Carrier supplies a total of 1,000 major consumers, including 18 municipalities and 80 local authorities. In 1996, a total of 730 Mm³ of water was supplied to consumers, of which 450 Mm³ was supplied for domestic and industrial purposes. (ibid. 2002)

The National Water Carrier functions not only as the main supplier of water, but also as an outlet for surplus water from the north in winter and early spring, as well as a source of recharge to the underground aquifers in the coastal region. Most of the regional water systems are incorporated into the National Water Carrier to form a well-balanced network in which water can be shifted from one line to another according to conditions and needs.

3.2.3 Water supply and demand

Israel water sources are primarily dependent on annual replenishment through rainfall. This is problematic because of various factors, the most important being short-term climatic variability and the possibility of longer term periods of significant declines resulting from prolonged drought. For example the Sea of Galilee has had annual inflows ranging from a low of 100 Mm³ in drought years (in 1991) to a high of 1 500 Mm³. (IMFA 2002)

In recent years, the water supply in Israel has reached a stage of critically fragile balance between supply and demand as a result of several factors (KKL-JNF. 2008):

- A sequence of drought years, resulting in inadequate replenishment of water reservoirs (both surface and underground aquifers) in combination with over-pumping of the already dwindling water reserves;
- Rapid increase in population due to immigration (from 4.8 million in 1990 to 6.3 million in 2000, 31% increase in 10 years), leading to increased water consumption for domestic use;
- Delays in the commissioning of large-scale projects of reclamation and purification of urban sewage water and construction of plants for desalination of seawater.

Annual water demand amounts to about 2100 Mm³/year, of which about one half is used for agriculture and the remainder is used by the urban and industrial sectors (Table 3.2.c).

Table 3.2.c: Water Supply (1998, 2010 and 2020)

<i>E. P. /Year (Million)</i>	6.0 / 1998	7.4 / 2010	8.6 / 2020
<i>Water Supply (Mm³)</i>			
<i>Surface Water</i>	640	645	660
<i>Ground Water</i>	1050	1050	1075
<i>Brackish</i>	140	165	180
<i>Treated Effluents</i>	260	470	565
<i>Desalination</i>	10	100	200
<i>Total</i>	2100	2430	2680

Source: IMFA, 2002

* Estimated Population for the years 1998, 2010 and 2020.

Table 3.2.d: Water Demand (1998, 2005, 2010 and 2020)

<i>Year</i>	1998	2005	2010	2020
<i>Water Sources (Mm³)</i>				
<i>Urban</i>	800	980	1060	1330
<i>Sector</i>	920	750	680	600
<i>Natural Effluents</i>	120	95	75	60
<i>Brackish</i>	260	380	490	640
<i>Wastewater</i>	1300	1225	1245	1300
<i>Total</i>	2100	2430	2680	2680

Source: IMFA, 2002

Regarding domestic consumption, public waterworks, supplying an average of about 250 litres per capita per day, serves all Israeli settlements. Similarly, about 95% of the return flow is collected, about 80% is adequately treated, and in many cases, reused for irrigation (42%). Drinking water quality conforms to World Health Organization (WHO) standards and further improvements to meet prevailing European Union and United States standards are planned. (KKL-JNF. 2008)

Currently, the urban sector consumes about 980 Mm³. The trend of consumption in the domestic sector is on the rise, reflecting the continuing increase

in population and improved living standards of the Israeli population. The annual increase is about 20- 30 Mm³ per year, about 4%; it is assumed that consumption will reach 1,300 Mm³, by the year 2020. (Table 3.2.d)

Without forgetting the agricultural consumption, and due to population growth and the associated water demand, the supply of fresh water resources to the agricultural sector has decreased from about 77% in the sixties, to about 60% at present. The reduced allocation is substituted with non-potable resources, including brackish and reclaimed sewage effluents. Although agriculture is still the largest consumer, consumption in this sector is strongly influenced by annual rainfall quantities, and during drought period's consumption is reduced. (KKL-JNF. 2008)

The Israeli Ministry of National Infrastructure is very concerned about an upcoming water deficit. It is evident that 50 years from now the total regional population may be in the order of 25-30 Million in comparison to the current 12 Million. On the other hand, the long-term deficit may reach 3000 Mm³/year, exceeding the natural rate of replenishment. Furthermore, improper control of waste in the region could cause irreversible contamination of the water resources. In particular, the already heavily polluted Karstic Mountain aquifer, left unmanaged, could have serious implications on the quality of water in the region (IMFA. 2002).

3.2.4 Water Allocations

In 1959, a comprehensive water law was passed, making water resources public property and regulating water resources exploitation and allocation, as well as pollution prevention and water conservation. Most regions in the country were declared "rationing regions", meaning regions where water consumption was to be limited to fix rations.

Therefore, norms were established for agricultural consumption and crops for per capita domestic consumption and for industrial consumption. Saying that, this legislation was based on the following principles (ibid. 2002):

- Water resources are the property of the public and that there is no private ownership of water resources;
- Every person has the right to a water allocation for recognized purposes;
- The overall quantity of available water is scarce and that a prioritisation process has to take place in order to provide sufficient water, in quantity as well as in quality, to all users;

- Only a centralized allocation of water resources can ensure an optimal use of the limited water resources;
- The consumers, through their representatives, need to have a major input in the formation of the rules relating to the allocation of water quotas;
- Attempts must be made to increase the water quantities available for utilization by the consumers;
- The government has the right to take appropriate action to prevent the pollution of water resources.

While the water source itself cannot be the subject to private ownership, water production, pumping and supply equipment may, and is in many cases, privately owned. Thus, once water is allocated the water is brought to the end user through the private sector.

Under the water law, all available water resources are for use by consumers, as directed by the Water Commissioner. The Water Commissioner is responsible for implementing the Government's policy, ensuring sufficient water supply of the required quality and reliability, while conserving and preserving water resources, including (ibid. 2002):

- Allocating water for the domestic, agricultural and industrial sectors, at the appropriate levels of quality, reliability and service, in accordance with national development plans;
- Planning, constructing and operating the water supply systems and delivery facilities necessary for meeting national demand;
- Advising the Government about water tariffs based on water quality and sector of consumption;
- Monitoring and evaluating water resources;
- Creating public awareness about water conservation needs.

Furthermore, and since the introduction of the Water Law, an annual water production and supply license is issued to each and every producer and supplier. The production license is a fundamental document reflecting the Water Commissioner's provisions regarding the amounts of water allowed for production, supply or consumption, conditions of production, and the restrictions to which it is subject. The first priority is given however to municipal and domestic supply. Accordingly the water allocations for all the sectors are (ibid. 2002):

Agriculture: The water allocation for agriculture makes a distinction between private agriculture and planned agriculture (Kibbutzim or Kibbutz: A collective farm or settlement owned by its members in modern Israel; children are reared collectively. And Moshavim Or Moshav: A cooperative Israeli village or settlement comprised of small farms). The initial stage was the recognition of water usage rights (not water rights) already existing at the time of the law's announcement, which was done by photographing the farmers' areas, their designation and the quantity of water consumed in those days. Subsequently, usage norms were established for the different crops, and the multiplication of the norms by the scale of crop cultivation determined the water quota for the farmer.

Water allocation for planned settlements was determined according to the types of soil and water production means as well as the number of units establishing the maximum size of the settlement. The maximum water allocation for the settlement was obtained by multiplying the number of planned farm units by the water quota per unit.

Industry: Establishing quotas for industrial plants whose production processes use more than 5,000 cubic meters of water a year is done based on the quantities of water consumption, according to the type of product and scope of production.

The multiplication of the norms by production scope constitutes the basis for water allocations in the plant. A plant whose wastewater disposal system does not meet the required criteria, does not receive a water consumption license.

Domestic consumption: The amount of water allocated to the local authority for domestic consumption includes the use of water for domestic needs, gardening, auxiliary farms, services and public utilities, trades, commerce, etc. within the domain of the local authority. In other words, the overall shared consumption of the local authority, excluding separate allocations for industrial and agricultural needs within its domain.

In recent years the amount of water allocated to local authorities, for various uses, has not been fixed. Every local authority is entitled to usage as per its requirements for various purposes; subject to the consumption difference between the quantities of water that it sells to consumers within its boundaries was not more than 12%. If the consumption difference is higher, the local authority is given a monetary fine. (KKL-JNF. 2008)

3.2.5 Extraction levies

In 1999 all those extracting water from water sources were charged with an extraction levy payment. The extraction levies reflect the regional and countrywide shortage and are intended to internalise the water shortage considerations. The rates of the levy are fixed in regulations and updated from time to time, in accordance with the updating set-up of the water tariffs. The obligation for payment of the extraction levy falls on the extractor, but he is entitled to collect it from his consumers their share of the extraction levy as well, together with the cost of the water, according to the quantity of water supplied to them. (IFMA. 1999)

If the water extractor does not pay the extraction levy, the Water Commissioner has the right to cancel, to suspend or to change the extraction license of that extractor from that water source. In parallel, in order to advance various goals for the benefit of the water economy, the law sets a framework for granting allowances from the State budget, for the production and development of inferior water sources, which will serve for the conversion of good water. (ibid. 1999)

3.2.6 Water prices

Mekorot provides more than two thirds of the water supply (see section 3.2.1). The prices the company is entitled to charge are the rates set by the Ministers of National Infrastructures and Finance, approved by the Knesset's Finance Committee, and updated from time to time according to the changes in the Consumer Price Index, electricity rates and the average wage index. (Mekorot. 2008)

The rates are categorized by the different uses: domestic, consumption and services, industry and agriculture.

The rates for industrial and agriculture uses are lower than those for domestic consumption and services for two major reasons:

- Water for agriculture and industry is designated for production;
- Water for agriculture is supplied on a less reliable basis and is of poorer quality. (ibid. 2008)

Rates within the local authority are set by the Ministers of Interior and Finance, based on the rate the local authority pays when buying water from Mekorot. The rates for agriculture and industrial uses within the local authority are identical, in principle, to Mekorot's sale price. However, the local authority collects distribution expenses to cover the costs of distributing and supplying this water within the authority's domain. Domestic consumption and service rates are set based on the

buying rate paid to Mekorot and the amount needed to cover the expenditures entailed in supplying this water with the required quality and reliability.

Domestic consumption rates are progressive and rise with an increase in the amount of water consumed. The first price is for the initial 8 cubic meters per month for each housing unit. The second price is for the next 7 cubic meters. For each additional cubic meter, the price increases gradually. Large families are allowed to have water price benefits, each additional family member over 4 persons is entitled to 3 additional cubic meters a month charged according to the first rate. (Ibid. 2008)

For gardening and landscaping a relatively low water rate has been set, identical to the first rate for domestic consumption. But this is only for a limited amount of water, 0.6m^3 per m^2 of garden, and for no more than 300m^3 a year per garden, for the period between April-November.

In condominiums, the limitation is up to 500m^2 of garden for each house. This is not a question of allocating water, but of providing water for gardening at a relatively low rate, such that the consumer can use a greater amount of water for the garden, but in such case the amount exceeding the 300m^3 or 500m^3 , as the case may be, is added onto the domestic consumption. (Ibid. 2008)

Shared consumption in condominiums is defined as the difference between the amount of water recorded by the general water meter for the condominium and the amounts of water recorded by the tenants' individual water meters. The shared consumption is divided equally among the housing units. If the shared consumption is higher than usual or has increased suddenly, this is usually a sign of a hidden leak in the property's internal system. In such a case, the local authority obliges the immediate repair of the hidden leakage and payment for the water lost.

If the local authority is convinced that repair of the hidden leakage has been carried out quickly and efficiently, it is entitled to charge for the water lost due to the leak according to the first rate of domestic consumption. A consumer, who uses a small amount of water, pays only a fixed usage fee, intended to cover the local authority's expenses for reading the meters and dispatching the bill, which must be done even if water consumption is very low. (Ibid. 2008)

Payment is based on the reading of water meters. Local authorities are required to supply water only under a measurement framework, using properly functioning water meters, and must notify consumers of a water meter reading at

least once every two months, charging them accordingly. The bill sent to the consumer must be based solely on the water meter reading.

If there is any change in the water rates during the consumption period covered by the bill, the assumption is that consumption was evenly divided over that same period. Therefore, the consumers will be charged according to the previous rate up to the day of change, and according to the new rate from that day onward. Where a water meter has not been installed, the charge for domestic consumption is for 15m³ a month, or 8m³ a month for small apartments, where no more than two persons reside, or 5m³ a month if only one person lives in such an apartment. (Ibid. 2008)

If found that the water meter has been malfunctioning during a certain period, and it is impossible to determine the water consumption of the consumer, the local authority is entitled to charge the consumer for an amount of water determined according to the average water consumption during the two months preceding the malfunction and the two months following it, or based on the consumption during the corresponding period of the previous year.

3.3 Management of Water Resources

The issue of water resources availability and the potential for further development of advanced systems to provide adequate supply was not merely an academic or technological question. It also had political implications. Indeed, national rights to the land lay at the heart of the conflict between the Jewish and the Arab communities.

British government policy was to place restrictions on the purchase of land by Jews, establishment of new settlements and also on immigration to Palestine, based on the argument that physical conditions prohibited further growth of the existing population. One of the measures taken by the leadership of the Jewish community to counter British policy was to demonstrate that, with proper development, the land could sustain a much larger population. Hence, considerable effort was invested in conceiving and designing water projects. (MNI, 2006)

There are a number of long-term solutions, such as building water desalination facilities. Short-term solutions include conserving water and building sewage water reclamation plants. (IMFA 2002)

Treatment of sewage water accomplishes two purposes:

- First, supplying purified water to the major water consumers, agriculture and industry;
- Second, preserving the environment and the quality of the aquifers. (Ibid. 2002)

Table 3.3.a: Government decisions to increase water resources

<i>Seawater desalination plants</i>	<i>400 Mm³</i>
<i>Brackish water desalination plants</i>	<i>50 Mm³</i>
<i>Rehabilitation of saline polluted and depleted wells</i>	<i>50 Mm³</i>
<i>Treatment and reuse of sewage effluents for irrigation</i>	<i>500 Mm³</i>
<i>Water import</i>	<i>50 Mm³</i>
<i>Total</i>	<i>1050 Mm³</i>

Source: MNI, 2002

Table 3.3.b: Supply development plan: Required investments 2002-2010

<i>Desalination (Millions US\$)</i>	<i>1,600</i>
<i>Sewage treatment and reuse system (Millions US\$)</i>	<i>1,000</i>
<i>Water supply (Millions US\$)</i>	<i>600</i>
<i>Renovation and improvements (Millions US\$)</i>	<i>800</i>
<i>Total (Millions US\$)</i>	<i>4,000</i>

Source: MNI, 2002

In addition and after several consecutive years of drought and growing water scarcity, the government has begun to implement a comprehensive water management plan, based on such components as wastewater treatment and recovery, water conservation, seawater and brackish water desalination and remediation of contaminated wells. Plans for desalinating hundreds of millions of cubic meters of seawater are implemented (see Tables 3.3.a, and 3.3.b).

Based on previously mentioned the government of Israel decided on an integrated policy and action (MNI. 2006):

- To preserve and protect the existing reserves, in quality and quantity;
- To intensify water saving in all sectors by economic measures, raising the price, as well as by legal means, enforcement, improved management and organization;
- To increase considerably the supply of potable water, mainly through seawater desalination and purification of water sources;

- To advance the treatment of sewage, its collection and purification, turning it into the main source of water for agriculture (replacing potable water);
- To invest in Agro-technology, to convert agriculture to using mainly low quality water; recycled waste water, brackish and flood water.

3.3.1 Desalination

Three types of desalination projects were initiated and supported, on a large scale in the past few years, by the Israel Water Commission, in order to generate new water supply sources and/or to upgrade the quality of existing water sources and supply systems:

Well Water Desalination: To rehabilitate and reintroduce into the local and national water supply systems 50 Mm³ per year of non-potable water, by the year 2010, the Israel Water Commission supported and supervised the installation of two desalination plants (around 1.55 Mm³ per year of potable water) plus the rehabilitation of another 27 wells (between 2003 and 2006), and an extra 19 projects are in the process of technical and economical evaluation in order to attain the set up target. (Ibid, 2006)

Most projects are executed through BOOT (Build, Own, Operate and Transfer) agreements between the well owners, water suppliers and private entrepreneurs with the State providing projects that meet threshold preconditions and requirements grants of up to 40% of their normalized investments. Typical well outputs are in the range of 80-200 m³/hour, and treated costs are in the range of 1.2-1.4 Israeli-Shekel /m³. (Ibid, 2006)

Brackish Water Desalination: More than 166 Mm³ per year of brackish water are pumped today from various boreholes throughout the State and used directly as a source of supply. Around 35 Mm³ per year are used by industry, the rest for agriculture. In Eilat and the Arava settlements, another 10 Mm³ per year of brackish water are desalinated, generating 7 Mm³ per year of potable water (the cost is between 1.4 and 1.8 IS/m³). (Ibid, 2006)

It is the intention of the Water Commission to increase the production of potable water through brackish water desalination:

- First, by replacing the brackish water currently used by industry and agriculture with suitably treated municipal effluents, and using the brackish water made available as raw feed for additional desalination plants;

- Second, by desalinating additional, unutilised brackish water sources. A total potential of about 200 Mm³ per year has been identified so far, and these could be used to generate about 50 Mm³ per year of potable water. (Ibid, 2006)

Seawater Desalination: The Government approved, in early 2002, the installation of seawater desalination plants with a total output of 400 Mm³ per year of potable water. All projects were to be executed by the private sector, through international tenders.

An agreement was signed at the Water Commissioners' Office in Tel Aviv on February 24, 2005, for the establishment of a second seawater desalination plant. The accord was signed by National Infrastructure Minister Binyamin Ben-Eliezer in the presence of Water Commissioner Shimon Tal and senior Finance Ministry officials. (Jerusalem Post. 2005)

A private company, Derech Hayam, will build the \$85 million plant in the Palmahim area, which will produce 30 Mm³ of purified water a year. The project is fully operational in 2007. This follows a plant that has been built at Ashkelon, which started to produce some 50 Mm³ of pure water summer 2005 and reached full capacity of 100 Mm³ by the end of 2005. (Ibid. 2005)

Plans and facilities

The water shortage obliged the National Infrastructures Ministry headed by Minister Benyamin (Fuad) Ben – Eliezer to initiate an emergency plan to deal with.

Table 3.3.c Seawater Desalination Facilities

Location	Name of the concessionaire	Execution phase	Annual volume (Mm³)
<i>Ashkelon</i>	<i>VID</i>	<i>Operational</i>	<i>108</i>
<i>Palmachin</i>	<i>Via Maris</i>	<i>Operational</i>	<i>30</i>
<i>Hadera</i>	<i>H2ID</i>	<i>Operational</i>	<i>100</i>
<i>Ashdod</i>	<i>Mekorot</i>	<i>Expected to be at the end of 2012</i>	<i>100</i>
<i>Sorek</i>	<i>In bid</i>	<i>Expected to be in 2012 for the first 150 Mm³</i>	<i>300</i>

Source: Adapted from MNI, 2008

The objective of the plan is to increase the volume of water desalinated up to at least 750 Mm³/y, of which 600 Mm³ will be completed by the year 2013, and the rest until 2020. Recent figures show that 138 Mm³ of water are desalinated in the Ashkelon and Ashdod plants, plus 100 Mm³ capacity of a new facility that has been constructed in Hadera. (MNI. 2008)

Table 3.3.c shows the desalination facilities which are operational, and the ones in the processes to be. These plants and facilities should provide to the Israelis the water they need to face this crisis.

It is important to mention in this regard that the cost of desalinated water from the Ashkelon plant is about 50 US cents/ m³, lower than from any other seawater desalination plant in the world. Desalinated water costs for the other, smaller projects are expected to be within 50 to 60 US cents/ m³.

Furthermore, a construction of a desalination plant (50 Mm³) in Gaza: drinking water and domestic consumption. Another 50 Mm³ one (brackish water): the Jordan Rift Valley (JRV), plus a 50-100 Mm³ desalination plant in the Mediterranean coast. In addition, a construction of a large-scale desalination plant of 800 Mm³ of water, utilizing the hydrostatic pressure obtained from the difference of the level between the Mediterranean and the JRV for production of electric power and desalination of huge quantities of water for the use of Israel, Jordan and the Palestinians. All together the completed project will provide 1 billion/m³ of desalinated water.

The proposed Regional Seawater Desalination project will be able (over a period of 10-15 years) to provide around 1 Bm³ of desalinated seawater, and provide a solution to the current water crises as well as meet the future needs of Israel, Jordan and the Palestinian Authority. It is important to mention that the time needed for planning and construction of a desalination project is not less than 5 years.

The calculated investment required for the desalination of 1 m³ of water is 4-5 dollars. The cost of desalination of 1 m³, including investment recovery, is 0.70-1.00 dollar. The cost is beyond the purchase capability, of both the Palestinians and Jordan, who also suffer from severe water scarcity. (Ibid. 2008)

3.3.2 Water importation

Turkey and Israel have signed a deal to allow Israel to purchase 50 Mm³ of Turkish water annually over the next ten years. The water will come from the Manavgat River and will be transported to Israel's Ashkelon port by ships. This deal

will also help Israel supply water to Jordan, as it has pledged to do under its peace treaty. Israel usually needs around two billion cubic meters of water annually and the Turkish water should supply five percent of its needs. (Jerusalem Post. 2000)

On August 2002, a groundbreaking agreement was signed, that will have Turkey export 1.75 billion cubic feet of water from its Manavgat River to Israel each year for the next 20 years. While the Turkish water is expected to fulfil only about three percent of Israel's needs, during the 20-year period. (Near East Report. 2002)

The deal, which will be worth \$800 million to \$1 billion, "will create a new reality in the region," Israeli Foreign Minister Shimon Peres (at that time) said. "I hope that Turkey will be the major supplier of water to the region." Still at issue is the actual transporting of the water to Israel, which is expected to entail a high cost. Oil tankers will likely be used, but must first be refurbished to make them safe for hauling water.

The water-purchasing deal was signed August 6 during a meeting between Israeli Prime Minister Ariel Sharon and visiting Turkish Energy and Natural Resources Minister Zeki Cakan (then). The penning of the agreement was the end result of years of negotiations between the two nations to finalize the terms of the deal. (Ibid. 2002)

3.4 Role of Irrigation in Agriculture

Until the beginning of the 20th century, agriculture in the Land was almost entirely rain-fed, and therefore was limited to the northern part of the country and the coastal area. In some northern localities, where spring-water was available, fields were irrigated. The water was conveyed by gravitation from the source to the fields in open dirt canals. Each farmer was supposed to get his share of water for several hours once every few days or weeks. However, due to heavy loss of water along the transportation route, resulting from fast percolation into the ground, the water was distributed unevenly.

Along the coast, underground water was raised from shallow wells with the help of "norias" (a water wheel with buckets attached to the rim) driven by donkey or ox. The water was collected in a pool and from there conveyed by gravitation to adjacent plantations (mainly orange groves). (IMFA. 1999)

Such wells were dug manually and the output was low; the notion that agriculture requires a reliable water supply began to take hold only at the end of the

19th century and the beginning of the 20th century. This revolutionary change in attitude was introduced to the area mainly by the Jewish settlers, who were ready to adopt advanced technologies and know-how. Such technologies were introduced by immigrants with specialized skills and professional training. Among them were people experienced in advanced methods of drilling through hard layers of rock and pumping large quantities of water from deep wells. (IMFA. 2002)

Eighty percent of farms are owned and run by kibbutzim (collective villages) and moshavim (cooperative villages). The remaining 20% are mainly citrus groves in the centre of the country owned by large private companies. Kibbutzim often develop, design, manufacture and market their own agro-technology inputs. Drip irrigation was developed in a kibbutz and all major manufacturers of the equipment are kibbutz-based. (Ibid. 2002)

These farmers work closely with the country's ten agricultural research institutes, including the Agricultural Research Organization (ARO) and the Hebrew University's Faculty of Agriculture in Rehovot. Twenty-five professional and marketing associations also fund R&D, as do various government bodies and hundreds of private firms in the biotechnology and computer software sectors.

Because Israeli farmers and scientists have had to contend with a difficult environment and limited water resources, their experience is especially relevant to the developing world. Development of greenhouse equipment, seed and livestock propagation, fertilizers and pesticides has enabled Israeli agriculture to prosper in adversity. In addition, farmers have learned to develop high value-added and innovative farm products that enable them to compete in markets with lower-cost producers. Water management, recycling, desalination and transportation in the National Water Carrier have enabled the country to overcome drastic shortages. (Ibid. 2002)

3.4.1 Advanced methods of irrigation

One of the most important agro-technological innovations is probably the invention in Israel of drip irrigation by Simcha Blass and his son (the father conceived the idea some 35 years ago, the son developed the dripper).

Today, networks of plastic pipes with small openings for each plant or tree are strategically placed across fields. Via the drippers, controlled amounts of fertilizer can be pumped through the irrigation pipes to the plants, a system known as

“fertigation” (the application of fertilizers, soil amendments, or other water soluble products through an irrigation system).

Traditionally, drip irrigation has been used in regions where water is scarce, but it has also been effective where rainfall is high because of its precision. For example, experiments in Northern California in “precision” irrigation caused some types of tree to grow three times faster. Fast-growing trees can increase profits for timber growers and at the same time minimize environmental damage by reducing the number of trees that need to be felled.

Half a dozen Israeli companies sell plastic piping and a full range of accessories for drip irrigation. Many also specialize in designing customized irrigation systems for gardens, parks, farms and entire regions, installing them and then providing consultation and maintenance. Exports of irrigation equipment totalled almost \$300 million in 1998. (IMFA. 1999)

Drip irrigation has many advantages over other irrigation methods. Studies show that drip irrigation has a Water Use Efficiency (WUE is defined as the ratio between the amount of water taken up by the plant and the total amount of water applied) of about 95%, versus 45% for surface irrigation and 75% for sprinkler irrigation. Accordingly, drip irrigation has many advantages over other methods of irrigation, and that it is also superior to surface and sprinkler irrigation in regard to water saving, especially under conditions of limited water supply (IMFA. 2002):

- Water is discharged uniformly from every dripper fitted onto the lateral pipe. This is true even on moderately sloping terrain. Furthermore, the development of compensated drippers enables uniform irrigation on steeper slopes and the ability to extend laterals with drippers over greater distances;
- Via the drippers, fertilizers can be supplied to the plant together with the water;
- Water and fertilizers are delivered directly to the root system rather than to the total area of the field, thereby economizing on both water and fertilizers;
- The quantity of water delivered can be optimised to fit different soil types, avoiding percolation of water beyond the root zone. Furthermore, sandy soils, which cannot be watered by furrows or by flooding, can be efficiently irrigated with drippers;
- The emergence of weeds is minimized;

- Between the planted rows the dry ground facilitates comfortable access in the field for workers and machines throughout the season;
- Exploitation of poor quality water (saline water or effluents) is made possible because:

- Drip irrigation, unlike sprinkler irrigation, makes it possible to utilize saline water. This is because direct contact between water and leaves is avoided, thus avoiding burns.
- Drip irrigation causes salts to be continuously washed away from the root system, averting salt accumulation in the immediate vicinity of the roots. This is important when irrigating saline soils or irrigating with saline water.
- Drip irrigation allows the use of minimally treated sewage water because the water is delivered directly to the ground, minimizing health risks.

- Drippers with a given discharge of water (of the order of several litres per hour) can be installed at any spacing to accommodate the needs of any crop;
- Drip irrigation is the most efficient method of irrigation when it comes to water saving. Since the drippers emit the water directly to the soil adjacent to the root system, which absorbs the water immediately, evaporation is minimal. This characteristic is especially important under the conditions prevailing in arid zones. In irrigation by sprinklers or by surface methods, evaporation is enhanced by winds, while in drip irrigation the impact of winds is minimal. Other types of irrigation include: pressure irrigation methods; buried irrigation, which prevents infiltration by tiny roots; spray irrigation, which is suitable for orchards; and sprinklers used for entire fields. These systems can be very simple or high-tech. (ibid. 2002)

Options range from the basic turn on/off variety with volume clocks, to more sophisticated computerized systems, which include sensors to monitor the moisture level of the soil and check changes in the diameter of the stem or fruit.

Other accessories include filter traps to sweep dirt away and low flow drip emitters for soil-less media in greenhouses. Minute or ultra-low-rate (ULR) irrigation methods have been developed to apply water at rates of less than one millimetre per hour. (ibid. 2002)

3.4.2 Conservation, use efficiency and water quality

In Israel, there is a growing awareness of the importance of conserving and purifying water. In public gardens and parks, the municipalities are requested to give preference to plants that do not require much water, and to reduce grassy areas. Parks have been placed under a conservation regime, including planting of drought-resistant plants and watering at night. Car-wash facilities receive an operating license on condition that they purify and recycle the water.

Local authorities are required to build facilities for treating sewage water, and Israeli farmers were asked to stop raising crops with high water consumption, and to go over to sophisticated cultivation methods that conserve water (such as hothouses and improved irrigation systems).

The wide scale adoption of low volume irrigation systems (e.g. drip, micro-sprinklers) and automation has increased the average efficiency to 90% as compared to 64% for furrow irrigation. As a result, the average requirement of water per unit of land area has decreased from 8,700 m³/ha in 1975 to the current application rate of 5,500 m³/ha. At the same time agricultural output has increased twelve fold, while total water consumption by the sector has remained almost constant. (ibid. 2002)

In the domestic and urban sectors conservation efforts focus on improvements in efficiency, resource management, repair, control and monitoring of municipal water systems. Citizens are urged to save water. The slogan “Don't waste a drop” is known in every home in Israel.

Beyond transportation, Israel has developed effective solutions for the shortage of water in some areas. Efficient water management has increased agricultural output 12-fold (as mentioned previously) during the past 50 years, while water consumption has remained constant through rigorous maintenance of infrastructure, replenishing of aquifers and the allocation of appropriate quotas and pricing to discourage wasteful consumption.

The use of recycled water has provided another solution. Out of 1.1 Bm³ of water used for agriculture in 1998, approximately 250 Mm³ were recycled effluents. The Water Commission forecasts, that by 2010 one third of all crops will be irrigated with “cleaned” water. Twenty-four desalination plants in Eilat, the Dead Sea region and the Arava Desert supply another 161 Mm³ of irrigation water each year. (ibid. 2002)

During a visit to Melbourne, March 2007, Professor Uri Shani (the director and chairman of the Israeli Government water and sewage authority) said: "We limited household use and started building a desalination plant in 2002", Israel could no longer gamble on the long-term use of aquifers. There were sustainability issues with the aquifers, which were saline. "So we decided to go into water production", he said (Hopkins, P. 2007).

The first plant, which produces 110 mega-liters of water at a cost of \$US250 million, is now up and running. A 40-megalitre plant is due to start this month. He said two 110-megalitre plants would be built in the next six years. This would help push up Israel's total amount of water available from desalination to about 400 mega-litres a year, "about half the demand of Israel's proven requirements". He said the desalination plants were part of a broader water strategy, which must cope with a growing population.

Another element is the huge use of recycled water. He said about 75 per cent of sewage was recycled and used on half of Israel's agriculture. "*It is good water, the supply is secure and it is cheap*", he said. "*It means (farmers) are no longer dependent on the weather*". Government water company Mekorot, which organises waste water treatment, has also invested more than \$100 million in a filtration plant for water pumped from the Sea of Galilee to ensure the water meets health standards. (ibid. 2007)

Another 70 Mm³ of water are generated annually from underground sources; geothermal waters found beneath the surface of the Negev desert are also used. Farmers have found that salt water produces "sweeter" crops than regular water. "Desert sweet" tomatoes and melons, for instance, fetch premium prices on European markets.

Cloud seeding (injecting clouds with iodine to increase the percentage of water that each cloud yields) has proven effective. Exploration (using sophisticated seismological techniques), prevention of pollution, soil conservation and drainage have all maximized water use. Landscaping to redirect floodwaters, computerized calculations to chart routes of runoff water and the strategic placement of trees and crops have also prevented desertification.

Invented by the Dutch for cooler climes in Northern Europe, the greenhouse has been adapted by Israel for use in arid regions. Some 3,000 hectares of

greenhouse cultivation enable farmers to overcome restrictions imposed by soil quality, arid climate and limited water supply.

Greenhouses can be erected in places where the soil is unsuitable. Irrigation systems overcome the problem of water scarcity, and curtains and skylights can be regulated to filter out or admit sunlight and provide temperature control. Plastic covering provides for thermal disinfecting of the soil prior to planting, covers the soil for heat collection, prevents growth of weeds and pests, and minimizes evaporation and the escape of fertilizers.

Netting above the plants can keep out scales, mites and other pests while more sophisticated netting can act as a thermal screen, cooling plants during the day and keeping them warm at night. Fogging systems can be used for climate control.

Operated by computer programs all these systems can be designed to generate a micro-environment on the cutting edge of 21st-century farming. Several Israeli companies manufacture and export woven high-tech plastic sheeting and specialize in custom greenhouse projects, including consultation, installation and maintenance.

Because of the high initial investment, greenhouses are best suited for high value-added crops such as vegetables, flowers, ornamental plants and spices, and for intensive farming. Israeli greenhouses, for instance, average three million roses per hectare and yield an average of 300 tons of tomatoes per hectare each season.

3.5 Main Freshwater Problems

A report of the State of Israel was presented on October 2000, to the Conference of the Parties of the United Nations Framework Convention on Climate Change on impacts, adaptation and vulnerability to climate change in Israel, indicates that water supply may severely decrease, falling to around 60% of current levels by 2100, due to sedimentation in reservoirs, salinity and the lack of reservoir recharge (Pe'er and Safriel. 2000).

Increased rain intensity combined with a reduction in overall precipitation will diminish vegetation cover and increase surface runoff, leading to desertification, especially in the Negev. The resulting soil erosion, salinity, and loss of vegetation will further increase surface runoff. Agricultural fields (mainly rain fed ones) will become more saline from increased evapotranspiration.

Increased surface runoff will reduce aquifer recharge, and sea level rise and the intrusion of seawater into the coastal aquifer will further damage groundwater. The quality of stored water will degrade due to salinity, and the increased surface runoff will transport dissolved pollutants to waters reservoirs, often causing algal blooms.

The most advanced technology and practices are being applied to protect and minimize the pollution of water resources. Water conservation maps, restricting land use activities above groundwater resources, were produced to protect the underlying resources.

Regular monitoring of water resources, including: water recharge, water table levels, abstraction, salinity (chlorides) and pollution (nitrates) data are regularly monitored and reported. The data provides an effective tool for influencing the planning, the development process, and permissible emission of pollutants to the environment.

3.5.1 Water Quality

Water resources from the Kinneret are diminishing, although it supplies Israelis with 22 - 33 percent of their water usage, and a larger percentage of drinking water. Recently certain algae have grown in the Kinneret, and treatment is necessary for any water taken directly from the reservoir. The source of the algae is unknown, but two nearby sewage plants are suspected culprits.

In the 1950's, an attempt at preventing the spread of malaria in the region forced much of the land surrounding the sea to be used for agriculture, and the draining of many swamps near the sea. As a result, water funnelled into the Kinneret no longer naturally filters out unneeded materials, the peat at the bottom of the old swamps combined with combustion, contributes to the enlargement of useless square feet of arid land.

The solution to this problem is by returning some of the water back to the old swampland. But another one will be created when new water is added. Israel must introduce aquatic life into the new bodies of water that have no natural predators. The unchecked growth of such aquatic life will compromise water quality.

Lake Winnepesaukee has also had its share of ills, including E-coli bacteria (a species of bacterium normally present in intestinal tract of humans and other animals; sometimes pathogenic, can be a threat to food safety), oil and gas. Boat

traffic accounts for the oil and gas increases, and an increase in boat rental fees helps to pay for this cleanup. (Weiss, B. 2003)

The quality of supplied water in Israel varies from very low salinity water (10 mg/l of chlorides) from the Upper Jordan River, 200 mg/l from the Kinneret, and more than 1500 mg/l from groundwater sources in the south. Groundwater exploitation is controlled to prevent seawater intrusion to the Coastal Aquifer and movement of saline water bodies within the Karstic Limestone Aquifer.

3.5.2 Water pollution

In recent years, efforts have focused on restoring the country's ailing rivers, which have either dried up or become sewage conduits as a result of industrial discharge, municipal sewage, over-pumping or just general abuse. The National River Administration was created (in 1993) to oversee the restoration of the country's rivers.

The Central Bureau of Statistics has released a report on "River Water Quality -- 1996-98", based on data compiled by the Water and Rivers Department of the Ministry of Environmental Affairs, the National Parks Authority and Yarkon River Authority. Pollutant measures include Biochemical Oxygen Demand (BOD), untreated sewage and industrial and agricultural waste.

Water quality tests are carried out each year. In 1998, it was found that very high quantities of pollutants were found in 11 rivers flowing near population centres. In five of the 11 rivers checked, pollution levels were very high, or else they were directly receiving raw sewage.

In the other six rivers, pollution levels were moderate to high. The rivers with the most significant improvement were the Dalia River, Hadera River and Habsor River (in the northern Negev). The improvements were mainly the result of sewage treatment plants beginning operations.

Israel's most polluted river is the Sorek River in the Judean Hills, and the least polluted is the lower Jordan River. (IMFA, 2002)

3.5.3 Government Concerns

Recently the Israeli government devoted part of its weekly cabinet meetings to the water crisis, with Minister of Infrastructure Benjamin Ben-Eliezer announcing that as a result of five consecutive drought years, of which the last was the most severe, it is only too likely that by 2009 there will be a real shortage of drinking water. It is

probable that the level of drinking water in wells and in Lake Kinneret will drop to the 'black line' during 2009. (KKL-JNF. 2008)

This means that it will not be possible to operate the pumps in Lake Kinneret, on the one hand, and it will be necessary to totally stop drawing water from the wells of the coastal aquifer, otherwise they will be irreversibly damaged, on the other hand. In any event, an additional sharp reduction in the usage of fresh water for agriculture will be required. This sort of reduction entails millions of shekels in damages and in compensation that will have to be paid to farmers, and, of course, the drying-up of extensive farming areas.

Minister of Agriculture Shalom Simchon wants municipal desalination plants to be built as speedily as possible in towns along the Mediterranean, in order to supply, by artificial means, a portion of the drinking water these localities require. This solution would save pumping from the coastal aquifer which is already in danger of severe over-salinity, and it would also avoid worsening the damage caused to agriculture by the expected reduction in the amounts of purified water used for irrigation.

At the same cabinet meeting, Prime Minister Ehud Olmert instructed that an emergency plan be drawn up to deal with the water shortage. Without such a plan, it will be impossible to deal with the present crisis. While several of the ministers supported the accelerated building of desalination plants in each town along the Mediterranean coast, others spoke of the need for massive enforcement and information campaigns on saving water in households. Whatever the outcome, the bottom line is real damage to the quality of Israeli life, which has progressed together with the general rise in the standard of living. (ibid. 2008)

3.6 Wastewater Treatments and Reuse

The combination of severe water shortage, contamination of water resources, densely populated urban areas and highly intensive irrigated agriculture, has made it essential to increase development of treated wastewater.

Wastewater treatment and disposal is generally dealt with by the health authorities that dictate the degree and criteria of treatment and discharge of effluents to water bodies according to public health standards. Advanced treatment is required for appropriate disposal of effluents, in a manner not harmful to recipient water bodies. Treating wastewater to such a high standard is very costly and the

Government has to assist the local governments, providing grants and soft loans amounting to more than US \$100 million per year.

The Administration for Wastewater Infrastructure within the Water Commission is responsible for coordinating activities between the Government ministries, local municipalities and operational bodies. These activities relate to all aspects of construction of waste treatment facilities and their disposal and reuse in accordance with criteria determined by the Ministry of the Environment and the Ministry of Health.

Israel has emerged as a world leader in recycling wastewater, with over 65% of the wastewater treated and reused for agricultural purposes in accordance with stringent permits issued by the Ministry of Health. National policy calls for the gradual replacement of freshwater allocations to agriculture by reclaimed effluents. Major efforts are currently being focused on upgrading effluent quality standards for different purposes. The objective is to treat 100% of the country's wastewater to a level enabling unrestricted irrigation in accordance with soil sensitivity and without risk to soil and water sources.

3.6.1 Policies and Ongoing Plan

The Government's objective is to increase the treatment and reclamation of wastewater. The aim is to produce safe effluents which correspond to the following principles:

- Accelerating the treatment and reuse of urban and industrial wastewater;
- Producing additional non-potable water at a competitive cost;
- Preventing the pollution of water bodies by adopting a zero discharge policy;
- Maintaining the current agricultural production.

These principles are supplemented by additional assumptions including:

- Cost sharing by the various beneficiaries;
- Economic justification and users' commitment to continuous reuse and compliance with regulations.

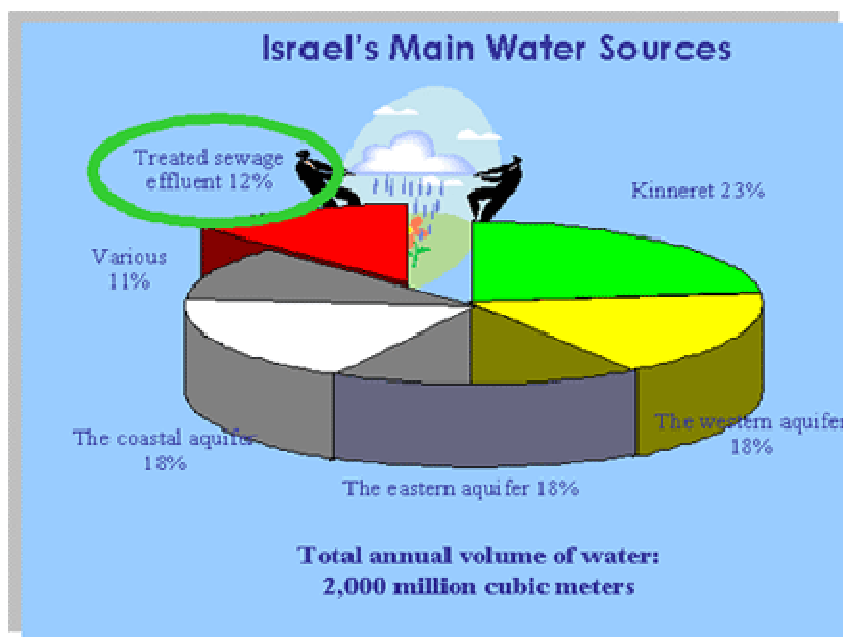
With the growth in population, great need for expansion and new construction of modern wastewater treatment plants. Currently the urban centres generate about 450 Mm³ of wastewater, of which around 360 Mm³ are drained to wastewater treatment plants. Of the treated effluents, about 265 Mm³ are reused for irrigation. Future development plans for the year 2020 signal an increase in raw wastewater to about 700 Mm³, of which about 570 Mm³ should be used. (KKL-JNF. 2008)

It is estimated that effluents constituted around 40% of the water supplied to agriculture in 2005, it is now more than 50% according to the Minister of Agriculture and Rural Development, Shalom Simhon:

“Over 50% of water used for agriculture is recycled water, which is the highest percentage in the world. Agriculture, as the main customer of recycled water, serves the environment, and lessens the pollution of streams and water sources. Using recycled effluents instead of fresh water is part of our water policy.” (Ibid. 2008)

Effluent reservoirs enable sewage water to be reclaimed and purified to a high standard for agricultural use. This reduces potable water consumption and prevents river pollution. Irrigation with freshwater can cost up to New Israeli Sheqel (NIS) 1.87 per cubic meter, irrigation with recycled effluents costs no more than NIS1.00 per cubic meter, which means savings of hundreds of thousands of shekels annually, depending on the size of the irrigated fields. (Ibid. 2008)

Fig 3.6.a Percentage of Treated sewage effluent



Source: KKL – JNF, 2008

3.6.2 Treatment processes

Effluents are treated in biological treatment plants, either in extensive oxidation ponds, aerated lagoons, or in advanced modified activated sludge systems, incorporating phosphorus and nitrogen removal.

Further treatment for reclamation and reuse is based on one of the following courses:

a) Advanced treatment followed by soil aquifer treatment, producing high-quality effluent (tertiary effluents) for unrestricted, non-potable usage. This treatment includes the percolation of denitrified effluents into a confined aquifer from which the effluents are pumped for unrestricted irrigation after a detention period of about 400 days. Such schemes are confined to areas with a large population concentration, such as the Dan Region Scheme, which caters to a population of about 2 million.

Furthermore, a system combining treatment and distribution to irrigated land has been established for medium and small towns. The key element is a large surface reservoir which receives secondary effluents all year-round, and releases them for the irrigation of non edible crops during the summer months.

This major element in the treatment process regulates between the relatively constant flow of wastewater and the seasonal demand for irrigation, six to eight months a year. There are around 200 surface reservoirs, 7 to 10 meters deep with a capacity ranging between 0.1 Mm³ and 12 Mm³, producing more than 150 Mm³ of sewage effluents and drainage water. These deep reservoirs have proven to significantly improve the effluent quality, thus providing high quality effluents without environmental nuisances. (Ibid. 2008)

b) Biological treatment followed by a long detention period in surface reservoirs producing effluents (secondary effluents), for restricted irrigation of non edible crops. It is important to say that reclaimed effluents, after tertiary treatment followed by Soil Aquifer Treatment, are used for the irrigation of all crops without any restriction. Tertiary effluents (activated sludge and seasonal detention, or activated sludge with sand filtration) are used on a restricted basis for the irrigation of canned fruits, vegetables for cooking and for fruits with non edible peels. Secondary effluents (activated sludge, trickling filters and oxidation ponds with seasonal detention), stored in surface reservoirs, are used, with restrictions, for the irrigation of industrial field crops (mainly cotton), fodder crops, forests and pastures. Water quality in surface reservoirs is inferior to aquifer storage.

One of the leading organizations in this domain is Keren Kayemeth LeYisrael-Jewish National Fund. Professor Uri Shani, Director of the Israel Water Authority emphasized the great importance of KKL-JNF's reservoirs. Speaking at the

international journalists' ecological conference held by KKL-JNF at the end of January 2008 he said:

"KKL-JNF reservoirs today provide an excellent alternative to fresh water for agricultural use, to the extent of 40% and more of the overall agricultural water consumption, and they help to relieve the present crisis in Israel's water economy. Additional help is provided by other large KKL-JNF projects for the rehabilitation of Israel's rivers and the restoration of water-based nature reserves such as the Hula Valley. Nonetheless, in both the coming summer and the summer of 2009, Israel will have to impose restrictions on the use of fresh water by limiting the irrigation of gardens." (ibid. 2008)

Also Mr. Avri Kadmon, Director of KKL-JNF Land Development Information Department, said in this regards:

"The State of Israel is on the brink of a profound water crisis, for which agriculture will be the first to pay the price. The gravity of the situation demands that action be taken now to reduce allocations of potable water for agriculture. This means that water used for agricultural production in Israel will come from the effluent reservoirs that KKL-JNF has established throughout the country. The combined total usage of the 200 reservoirs built by KKL-JNF so far reaches over 250 Mm³ of water per year. In other words, the water stored in KKL-JNF's effluent reservoirs permits the irrigation of over 450 thousand dunam - about 112.5 acres - of orchard and field crops throughout Israel!

"Israel's total water consumption today stands at around one billion 850 million cubic meters of water per year. KKL-JNF reservoirs supply some 16% of the country's overall water consumption and some 40% of its water for agricultural purposes. As consumption rises with population growth and improvement in the standard of living, so, too, will the amount of effluent produced increase proportionately. This means that it is vitally important to establish additional reservoirs for the storage of treated effluent, both in order to increase the amount available for agricultural purposes and to prevent pollution of the environment as a result of insufficiently treated effluent's reaching our rivers." (ibid. 2008)

3.6.3 Existing projects

Reuse of effluents is generally relevant to the agricultural sector, which consumes between 1200 and 1300 Mm³ of water per year (around 60% of total water consumption). Wastewater effluents are already used for irrigation in all parts

of the country. In some regions (Haifa and the Northern Valleys) the practice is well established and virtually the entire quantity of effluent available is utilized. In other regions (Western Galilee and the Northern Coastal Plain) the practice is only partial. Existing projects addressing the treatment and utilization of wastewater from major urban centres are:

1) Dan Region Project: This project, which serves the Tel Aviv Metropolitan Region, treats about 110 Mm³ of wastewater annually. The wastewater is treated and recharged into the local aquifer. Percolation through, and absorption by the sandy soils, provide additional treatment. The effluents are filtered through ground basins employing an intermittent flooding and drying regime. A network of observation wells surrounding the recharge area monitors the quality and ensures that the treated water does not flow towards fresh water wells beyond the confined recharge area.

Results obtained so far indicate that the spreading basin-unsaturated zone-aquifer system is effective in purifying secondary effluents and upgrading them to a level suitable for unrestricted irrigation and for a variety of industrial and non-potable municipal uses.

2) The Kishon Scheme: Produce effluents restricted for the irrigation of non edible crops. The most significant of this type of scheme renovates the wastewater of the Haifa Metropolitan Area, which amounts to 30 Mm³ per year. After conventional activated sludge treatment, the effluents are conveyed to the Yizreel Valley, some 30 kilometres to the east, where they are impounded in a 12 Mm³ reservoir for summer irrigation of cotton and other non edible crops. A total of 60 Mm³ per year is being used by the irrigation scheme, including about 15 Mm³ of fresh water from the National Carrier.

In addition, other schemes employing different treatment processes have been developed for the treatment and utilization of sewage from medium-sized towns. In these schemes, the level of treatment ranges from advanced treatment of the activated sludge type to aerate and oxidation ponds, as well as less thorough means.

The effluents are subsequently diverted directly or from open channels to a series of surface reservoirs, from which they are later used for irrigation.

3) National Projects: The ongoing and planned wastewater reuse projects fall within three categories: National, Regional and Local projects. The national

projects are owned and operated by Mekorot - the National Water Company. The regional and local projects are owned and operated by Regional Water Users Associations. In some cases, the regional and local projects are jointly owned or operated by Mekorot and the regional/local water users.

For national and regional projects financed by public funds, the charge paid by the user is fixed by the Government. Most of the regional and local projects are self-financed and the charges are determined by the users, without any Government intervention.

The development plan covers new projects and expansion of existing ones as follows:

- **The Dan Region Sewage Reclamation Plant:** The expansion of the Dan Region Project from the current volume of 110 Mm³/year to a capacity of 160 Mm³/year has been approved by the Government;

- **Haifa Kishon Complex:** The Haifa Kishon Complex Scheme is being expanded, increasing the capacity of the pumping units and extending the main conveyance system, to allow the connection of new consumers;

- **West Bank Collectors for the Prevention of Pollution of Groundwater Aquifers:** Currently, wastewater generated from the cities and villages of the West Bank are discharged into the dry rivers. The direct health hazard and the environmental nuisance are coupled with the inevitable deterioration of water quality of underground aquifers;

- **Regional Projects:** Major regional works were initiated in the seventies to receive, treat and reuse the wastewater from most of the urban centres in the various regions, including: Western Galilee, Kinneret Watershed, Inner Valleys, Hadera-Netanya, Yarkon South, Jerusalem, Ayalon South and Beer-Sheva West. The plan for the coming years is to expand the existing projects and to initiate new projects, in the Western Galilee.

3.6.4 Investment requirements

The cost of treatment and reuse depends on the size of the plants (whether new, renovated or expanded), as well as the various treatment stages and disposal options. Assuming the treatment of a total quantity of 200 Mm³, using a combination of secondary and advanced treatment followed by reuse for irrigation, the total cost will amount to about US \$650 million, as compared to US \$760 million for treatment and sea disposal. (KKL-JNF. 2008)

The investment costs are to be accepted by the farmer, who utilizes the effluents for irrigation; the local authority, which would otherwise have to pay for more advanced treatment and disposal by conventional methods; and the State, which is concerned with alleviating the water scarcity and protecting environmental quality.

3.7 West Bank and Gaza Strip

The Occupied Territories and Israel are dependent on the same water resources and the current use and control of this water is based on Israel's territorial control and political objectives.

Jews and Palestinians have both used the region's groundwater for generations. Both sides base their claims to this limited resource on historical use, territorial possession and basic human needs.

The Israelis claim that during the late 1980s and early 1990s, Jewish farmers began developing the region's groundwater resources more effectively to support their expanding farming practices. Following the establishment of the State of Israel in 1948, water resource development further expanded to support the growing Israeli economy.

By 1967, and prior to Israel's occupation of the West Bank, Israel was already utilizing a major portion of the available water resources of the Western and Northern Basins through the full development of springs, rivers and wells in Israel.

Hence, Israelis claim the right to the water naturally emerging or pumped in Israel and which historically has been extracted since before even the creation of Israel. They base their claim on the significant damage that would result from the loss of the Israel's current level of use, necessary to meet the country's vital economic and human needs.

On the other hand, Palestinian development of the region's groundwater resources has been relatively limited. Prior to the establishment of Israel, Palestinians lacked the financial and organizational resources necessary to develop the region's aquifers. While they did maintain and use various wells and springs in the region, new wells were rarely dug, many natural springs remained unused, and there was little industry or economic growth to justify investment in water resources.

Before 1948, few Palestinian villages developed central water supply systems. Later, under the Jordanian administration of the West Bank between 1948 and 1967, little if any improvement happened.

Also based on historical use, territorial possession and human necessity, Palestinians claim right to the region's groundwater. Furthermore, the Palestinians debate that since most of the region's aquifer recharge (Fig. 3.7.a) falls (as rain) over the West Bank, by virtue of sovereignty over the territory, they should have first opportunity to use and exploit the resources. Adding that Palestinians suffered, and still, from severe shortages and point to the huge disparity between the average amounts of water available to each Palestinian.

It is important to mention that Palestinians and some legal scholars assert that Israel's extraction of water inside the West Bank since 1967 is a direct violation of the Geneva Convention, which applies to international armed conflict and addresses the obligations of a "belligerent occupier" (under the Convention, a belligerent occupier may use the natural resources of an occupied land to support its military forces of occupation.

However, it may not use those resources to support its own civilian's activities). This argument is highly contested by Israel and other legal scholars, especially the characterization of the Israeli-Palestinian conflict as being international and, hence, the applicability of the Geneva Convention to the situation.

3.7.1 West Bank and Gaza Strip Water Resources

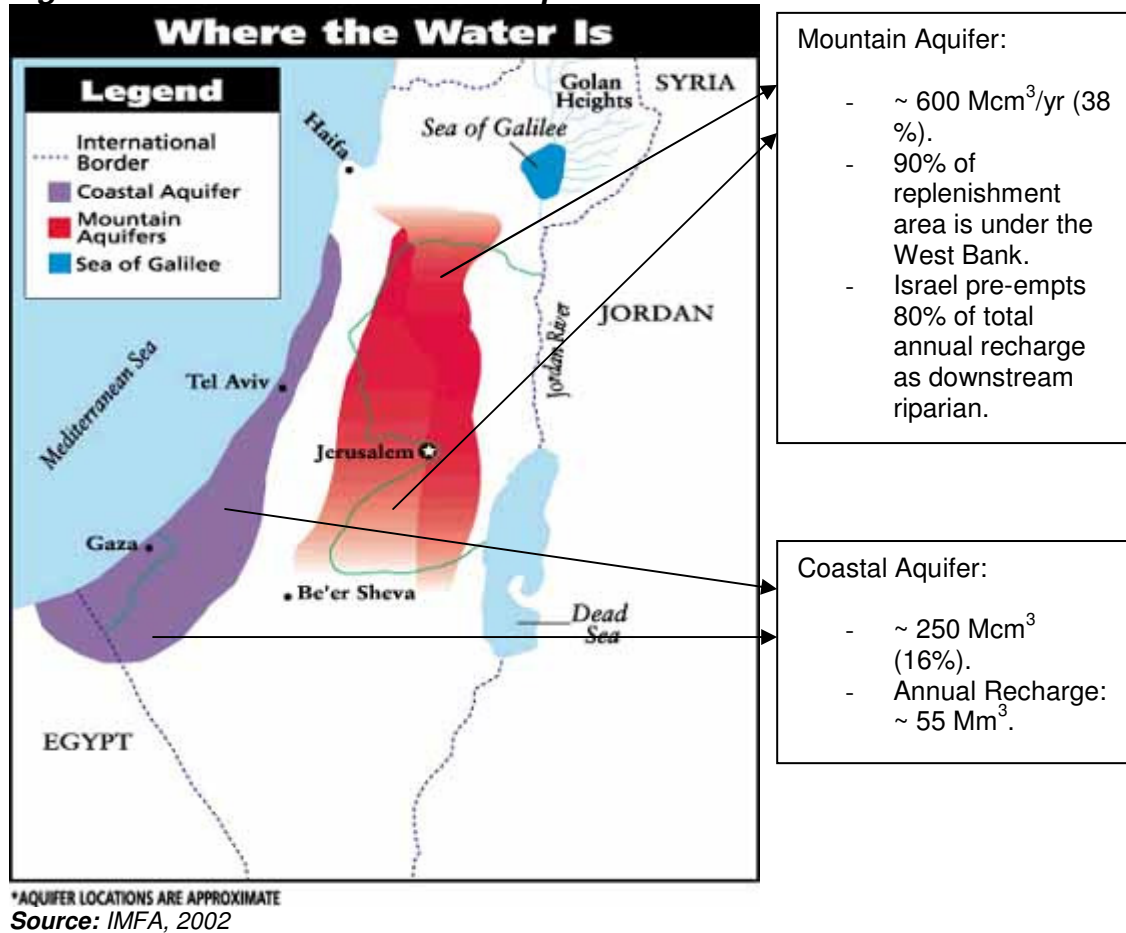
The groundwater sources consist of underground aquifers and sub aquifers that are recharged by rainwater and underground flows between the basins.

The surface water sources consist of perennial and seasonal rivers and lakes, the Jordan River and its tributaries, and Lake Tiberias (Sea of Galilee) being the major ones.

The West Bank and Gaza Strip constitute two quite different areas in terms of topography, geology, and rainfall patterns.

About one third of the State of Israel's national water consumption, some 600 Mm³/year, of water is produced from the Upper Cretaceous aquifer, often referred to as the Mountain Aquifer (Fig. 3.7.a), that are recharged along the axial part of the Samarian-Judean Anticlinorium running along the north-south direction through most of the West Bank territory.

Fig. 3.7.a: Mountain and Coastal Aquifers



Hydro-geologically, the pre-1967 Israeli territories are downstream of the Western and the Northern Aquifers. In other words, groundwater flows from the recharge areas along the high ridges populated by the Palestinians across the 1967 “green line” boundaries into Israel.

The 6,000-km² Western Mountain Basin extends from the Judean Desert northward to the Carmel Mountain foothills, and from near the centre of the Mountain Belt westward to the Coastal Plain.

The annual rainfall varies between 500 - 709 mm on the western slopes and 100-500 mm on the eastern sides. Rainfall is the West Bank’s main source of water, mainly during the short rainy season (November-May); 68 percent evaporates and the rest filters down to replenish the aquifer.

A small amount drains off as surface runoff. The only perennial surface source is the River Jordan, which runs along the West Bank’s eastern border. Thus, Groundwater constitutes the major source of water.

Table 3.7.a: Groundwater Resources and Overall Water Consumption

<i>Water Resources (Mm³/year)</i>	<i>Annual Recharge</i>	<i>Israeli Consumption</i>	<i>Settlements Consumption</i>	<i>Palestinian Consumption</i>	<i>Total Water Consumption</i>
<i>Mountain Western Basin</i>	362	344	10	22	376
<i>Mountain North-Eastern Basin</i>	145	103	5	30	138
<i>Mountain Eastern Basin</i>	172	40	35-50	69	144-159
<i>Israeli Coastal Aquifer</i>	250	260	0	0	260
<i>Gaza Coastal Aquifer</i>	55	0	5-10	110	115-120
<i>Treated Wastewater</i>	450	450	0	0	450

Source: International Water Resources Association

Precipitation recharges the groundwater system at an average volume of 366 Mm³/year (Table 3.7.a). The groundwater flows from the recharge zones in a general westward and northward direction across the 1967 border.

3.7.2 Gaza-Strip's Water

Situated along the southwest coastal plain of historic Palestine and bordering the Mediterranean Sea, the Gaza Strip has an arid climate. There are no permanent surface water sources. Although in some years there is a little temporary surface runoff, almost none of this water is collected. Annual rainfall is far lower than in the West Bank, falling from 350 mm in the north to 150 mm in the south, and rates of evaporation are extremely high.

The only significant source of water in Gaza Strip is groundwater (Table 3.7.a). This is replenished directly by rain water infiltration and by underground flows from the Negev in the east in areas inside of the "Green Line". At present, groundwater sources are replenished by rainfall, irrigation runoff, and cesspool sources, the latter two of which result in severe contamination of the groundwater

reserves. In addition, Israel's over pumping inside the "Green Line" is preventing replenishment of the Gaza Strip aquifer by fresh water.

A new study by the European Union's FP5 project (the Fifth European Community Framework Program) found that the Palestinians pump about 140 Mm³ of water from more than 1,000 wells annually from the southern coastal aquifer. Many of these wells are privately owned, and most of them are not under any sort of supervision.

In addition the population of the Gaza Strip, which numbers more than one million, is increasing by 70,000 people a year. The coastal aquifer will not be able to meet rising demand. The quality of the water used by the Gaza Strip residents has already deteriorated and does not meet any international standard.

The concentration of chlorides (a gauge of salinity) is above 1,000 milligrams per litre, whereas in Israel the maximum permitted amount in drinking water is 600mg/l. The nitrate concentration (a measure of pollution originating in sewerage and fertilizers) has been found to be more than 500 milligrams per litre in some places the Israeli standard is 70mg/l.

3.8 Conclusion

The Jordan River basin (Jordan, Israel, Syria, Lebanon, and the Occupied Territories) will sustain 12 to 14 million people, and the population of the region will exceed that number by 3 to 4 million over the next two decades. As a result, forecasts heightened external and internal competition in these countries over decreasing amounts of water. This competition will most likely take the form of internal civil disorder rather than 'water wars' between states.

The 2008 rainy season is ending with a deficit of 500 million cubic meters of water. Until 2014, it is not expected that the level of drinking water in the aquifers and in Lake Kinneret will rise above the lower 'red line' which marks the minimal quantity of water reserves needed for an ongoing regular supply.

The water shortage will affect not only the supply of sweet water to private consumers and to farmers, but also the usage of recycled water in agriculture. There is a danger that, as a result of the demand to save fresh water, there will also be a reduction in the quantity of domestic sewage water that is purified and transferred for re-use in agriculture. This will also affect the diverse network of water reservoirs for the recycling of water. The 200 reservoirs built so far now provide about 45% of all

the water used in agriculture, mainly for different kinds of orchards. For public health reasons, this water is not used for field crops, and only for orchards, as the trees' branches do not come into direct contact with the water.

One of the solutions suggested by the head of the Water Authority, Professor Uri Shani, is improved utilization of temporary water sources, such as flood waters. Professor Shani advised augmenting the infrastructure for flood-water collection in channels where the floods are usually relatively higher. This recommendation actually entails expanding the system of water storage. (KKL-JNF, 2008)

Israel's hydrological concerns in the Occupied Territories outweigh its ideological and security fears since 40% of Israel's water originates in the occupied West Bank. Therefore, Israel suggested several solutions to ameliorate water shortages including:

- The creation of a basin-wide water authority and;
- Restructuring basin economies away from heavily irrigated agriculture toward other sectors like electronics, services, and light industry.

After several consecutive years of drought and growing water scarcity, the government has begun to implement a comprehensive water management plan, based on such components as wastewater treatment and recovery, water conservation, seawater and brackish water desalination and remediation of contaminated wells. Plans for desalinating hundreds of millions of cubic meters of seawater are currently being implemented.

The proposal for reallocation of the insufficient current resources of water, coupled with the continued threat of desert encroachment, will not solve the problem of water scarcity, neither for Israel nor for its neighbours. It will only perpetuate the water shortage or place the entire burden of desalination on the shoulders of Israel.

The solution, besides the general economic development of Israel's neighbours, is to assist the neighbours of Israel to meet the cost of seawater desalination (specifically for the Palestinian and for Jordan) for a period of few years.

It is important to say that the Groundwater in the three basins (the Weastern Basin or Yarqon-Tanninim Aquifer to the west towards the Coastal Plain, the so-called Eastern Basin to the east towards the Jordan-Dead Sea trough and the so-called Northern Basin to the north draining towards Valley of Jezreel or Esdraelon and Beit Shean Valley) will, most probably, be considered a transboundary water

resource between Israel and the future Palestinian State, and in the light of general scarcity of water resources in the region, will be subject to contentious negotiations.

The controversy over water resources will be a difficult problem to overcome. Although there were a number of cooperative efforts made at addressing issues of quality and allocation of water resources shared between the Israeli and Palestinian societies, neither party has ever agreed to waive its claims to what it considers its fair share.

The region's water resources are insufficient to provide the needs for both parties; accordingly new sources of freshwater must be identified. With growing populations and the need for economic development, especially by the Palestinians, there is a desperate need for the Israelis and the Palestinians to shift their focus from accusation and condemnation toward efforts pitched at finding new sources of freshwater.

4 Lebanon

Lebanon is more than just a land, it is a message! John Paul II

4.1 Introduction

Lebanon is situated on the eastern coast of the Mediterranean Sea, bounded on the north and east by Syria (375 km) and on the south by Israel (79 km). From east to west it averages around 50 km, meanwhile the coastline stretches over 225 km from north to south; its greatest width from west to east is 85 km. Total area of Lebanon is 10,450 square kilometers (of which 10,280 km² are land area and 170 km² are water area).

The terrain is a narrow coastal plain followed by Lebanon Mountains (western mountains), the Bekaa valley, and the eastern mountains that extend to the Syrian border. The highest altitude in the country, Quornet Al-Sawda rises to over 3,080 meters and is covered by snow for most of the year.

The last population census in Lebanon is dated back to 1932. Since then, population estimate is based on partial surveys. In 1997, the Lebanese population was estimated at 4 million inhabitants; more than 10 percent are non-Lebanese (Wikipedia. 2008). Palestinians constitute the vast majority of foreigners, estimated at around 400,000 inhabitants, of who around 50 percent are living in refugee camps. Other nationalities include Syrian, Egyptian, Sri Lanka, Philippine and others that mainly represent the foreign labor, mostly doing blue-collar work.

The region known as greater Beirut is heavily populated with around 1.5 million inhabitants, of which 400 thousand are residing in the administrative region of Beirut, capital of Lebanon. Other major cities are Tripoli 91 km north of Beirut, with about 250,000 people; Saida 41 km south of Beirut, with about 80,000 people; Tyre (Sour) 79 km south of Beirut with about 30,000 inhabitants, and Zahle 47 km east of Beirut with about 80,000 people.

Lebanon has a Mediterranean climate along the coast and alpine in the mountains, with long sultry summers and short mild winters. Average humidity along the Coast Ranges from the high 60's to the high 70's. During the summer months from May through September, the average daily temperature in Beirut ranges from 22° C (72° F) to 30° C (86° F), it feels hotter due to humidity levels. The thermometer

hovers around 23° even at night. January and February are the coldest months of the year when the average temperature in Beirut is 14° C (55° F), rarely falling below 8° C (46° F).

In the hottest months the mountains provide a welcome relief from the endless heat of the coast, though the daytime temperatures are about the same as in Beirut, the humidity is much less and the nights are cooler. The Bekaa Valley is very hot and dry in summer with temperatures reaching the high 30's though the nights are cool. Bekaa Valley winters are cold, wet and windy. The Spring and Autumn seasons are short but pleasant. Average annual rainfall is 893 mm, of which about 85 per cent are in the winter months. Unlike some other Arab states, Lebanon does not have oil. The most abundant resources the country is rich of are water and fertile land. However these sources are still under-utilized. Lebanon has two major rivers: the Assi and the Litani.

4.2 Freshwater in Lebanon

Lebanon has a wealth of water resources in its numerous rivers (appendix 2, annex 1, map 2), underground aquifers, and plentiful rainfall in the winter. The fundamental problem is that more than half of the rainwater flows unexploited into the sea, accompanied by poor water management. Human activities put pressures on both the quantity (water abstraction) and quality (water pollution) of water resources.

Many activities affect, mainly negatively, the water cycle (deforestation, dams, irrigation, drainage canals) thereby altering the conditions for water replenishment. For example, soil erosion and the loss of plant cover (rainfall intercept) diminish groundwater recharge.

Continued soil erosion and loss of plant cover, forests include, will lead to scarcer water resources and poorer water quality in the future. Water quality will not improve until the practice of disposing untreated wastewaters on land and into streams and rivers ends. Finding proper solutions should enable Lebanon to meet all its own needs and be an exporter of hundreds of millions of cubic meters of water to its parched neighbours.

4.2.1 Fortunate hydrological position

Lebanon is in a relatively fortunate hydrological position. It is estimated that the yearly precipitation results in an average yearly flow of 8,600 Mm³, giving rise to

40 major streams and rivers (including 17 perennial rivers) and more than 2000 springs. Despite this, many experts predict that Lebanon will experience a water deficit within 10 to 15 years, mainly because there is general and widespread concern in Lebanon about water, reflecting the country's insecurity about perceived and real threats to its sovereignty over water resources. This attitude affects the quality of water data collected, analysed, and published.

This makes it difficult to manage water resources adequately at present and to make meaningful projections into the future about potential use and availability of water. Water stress in neighbouring countries including Syria, Israel, West bank Gaza and Jordan is a harsh reminder that Lebanon must rethink its water strategy and protect its water resources by imposing radical water management policies that should be developed and implemented.

According to the UN's Economic and Social Commission for Western Asia (ESCWA), Lebanon has an annual supply of 2,850 Mm³ of water, of which 400 to 1,000 Mm³ is in underground reserves. A U.S. Company, Parsons, which undertook a preliminary study of Lebanon's water situation in 2001, believes that Lebanon has the potential to develop its water resources so that around 4,500 Mm³ of water annually would be available, much of which could be sold to the region. (ESCWA. 2000)

Lebanon, however, has yet to exploit these water resources and even suffers from water shortages because of supply and management problems. Estimates of Lebanon's annual water demand vary from 1,100 to 1,400 Mm³. A US aid-funded study by Development Alternatives in 2001 estimated that Lebanon uses 75 percent of its annual water supply for irrigation (ibid. 2000).

Domestic use accounts for 165 Mm³ and industrial use 130 Mm³. However, the Parsons study concluded that real domestic demand for water is over 300 Mm³ and that the Government of Lebanon cannot meet almost half that amount. Demand for water is expected to rise to 2,500 Mm³ by 2015, and perhaps as much as 4,000 Mm³ by 2025, according to ESCWA (Tayyar N. 2002).

1) Water balance, and precipitation distribution: Multiple studies estimated the annual water balance in Lebanon at approximately 8,600 Mm³ (the average yearly precipitation) with nearly 50 percent lost through evapotranspiration, while additional losses include surface water flows to neighbouring countries (estimated by the Litani River Authority to represent about 8 percent) and groundwater seepage

(almost 12 percent). This leaves 2,600 Mm³ of surface and groundwater that is potentially available, and of which 2,000 Mm³ is deemed exploitable (Table 4.2.1.a).

Table 4.2.a: Yearly Water Balance

Precipitation (Mm ³ /Y)	Evapotranspiration (Mm ³ /Y)	Groundwater seepage (Mm ³ /Y)	Surface water flows to neighbouring countries			Net potential surface and groundwater available (Mm ³ /Y)	Net exploitable surface and groundwater (Mm ³ /Y)
			Syria		Israel		
			(1) Mm ³ /Y	(2) Mm ³ /Y	(3) Mm ³ /Y		
8,600	(4,300)	(1,030)	(415)	(95)	(160)	2,600	2,000

Source: Ministry of Environment (MoE)/Lebanese Environment and Development Observatory (LEDO), 2001.

Notes: - Precipitation estimated from isohyet's map, and flows to Syria from National Litani Organization.
 - All figures between brackets represent losses.
 - (1) Al Assi River flows to Syria.
 - (2) Al Kabir River flows to Syria (represents the border between Lebanon and Syria).
 - (3) Hasbany River flows to Israel.

Precipitation in Lebanon is unevenly distributed, up to 90 percent of falls between November and April. Several parts of the country experience zero rainfall during the remaining six months, which implies the need for water storage. River runoffs peak during the wettest months with only small base-flows at all other times, when water is usually most needed.

Table 4.2.b: Recorded rainfall

Station	Year					Average	
	1996	1997	1998	1999	2000	1996-2000	1961-1990
Beirut	827	733	658	487	834	708	825
Zahle	798	686	533	311	614	588	-
Tripoli	844	639	694	378	872	685	-

Source: MoE/LEDO, 2001

Annual precipitation can reach up to 2,000 mm in some areas and barely makes the 200 mm mark in others. Coastal areas experience 600 to 1,000 mm annual rainfall, neighbouring mountain areas between 1,000 to 1,400 mm and between 200 and 600 in the North and Central regions, and around 600 to 1,000 mm in the South. (LEDO. 2001)

Table 4.2.b shows recorded rainfall in Beirut, Tripoli and Zahle Meteorological stations. Prior to the "civil war" (1975), Lebanon had more than eight stations spread across the country. Many were damaged during the war and meteorological records

were interrupted for several years. Several stations were rehabilitated in the 1990s. In addition, several research centres and universities operate as auxiliary weather stations.

2) Surface water resources: In Lebanon there are 17 perennial streams and 23 seasonal ones. Thirteen Rivers flow west from their source in the Mount Lebanon range to the sea: Ostuene, Aaraqa, Al Bared, Abou Ali, Al Jaouz, Ibrahim, Al kelb, Beirut, Awali, Litani, Al Zahrani and Abou Assouad. Al Kebir River also flows west and traces the northern border of Lebanon with Syria.

The Litani River Drains the southern Bekaa plain crosses the southern periphery of the Mount Lebanon range and discharges into the sea north of Tyre. Al Assi or Orontes River flows north in Syria draining the northern Bekaa plain. The Hasbani River crosses the southern border and forms one of the tributaries of Jordan River (appendix 2, annex 1, map 2).

Table 4.2.c: the 17 Perennial streams in Lebanon

River name	Length (Km)	Flow in Mm ³		
		Annual	Max.	Min.
<i>Al Kabir</i>	58	190	13.9	1.8
<i>Ostuene</i>	44	65	4.01	0.8
<i>Aaraqua</i>	27	59	6.27	0.8
<i>Al Bared</i>	24	282	15.2	2.7
<i>Abou Ali</i>	45	262	37.3	1.6
<i>Al Jaouz</i>	38	76	6.18	0.4
<i>Ibrahim</i>	30	508	27.6	1.9
<i>Al Kalb</i>	38	254	18.1	2.4
<i>Beirut</i>	42	10	10	0.1
<i>Damour</i>	38	307	32.7	0.6
<i>Al Awali</i>	48	299	26.2	3.9
<i>Saitani</i>	22	14	1.3	0
<i>Al Zahrani</i>	25	38	3.4	0.3
<i>Abou Assouad</i>	15	11	-*	-*
<i>Litani</i>	170	793	30.8	4.3
<i>Al Aassi</i>	46	480	20.9	11.5
<i>Hasbani</i>	21	151	11.3	1.6

Source: Ministry of Environment/LEDO, 2001.

* No data available.

Table 4.2.c presents the length and the annual flow rates, plus the minimum and the maximum flow rates recorded for each river. Most of these rivers flow peak during March and April, some reach maximum flow, as the Aassi River, in July. Minimum flows are typically recorded in September and October.

3) Underground aquifers: The country's limestone formation has many fissures and fractures, which allow rainwater to infiltrate deep into the ground. The estimates for the groundwater quantity available for exploitation range from 400 to 1,000 Mm³/yr according to different sources of information. (Amery. 2000, MoE/LEDO. 2001)

The water in these aquifers, either:

- Remains stored in aquiclude (impermeable ground: a layer of rock, sediment, or soil through which ground water cannot flow), some may be exploited through wells while other remains untapped in deep layers;
- Reappears as surface waters, at lower elevations, in the form of springs;
- Forms submarine springs discharging near the coastline or the sea, are lost to deep layers and many reappear in the groundwater of neighbouring countries.

In this context, it is important to mention that the most comprehensive study is the one of the 1970s, which has been conducted by the UN (1970 UNDP report of underground aquifers in Lebanon).

The country has been divided into two distinct hydro-geological provinces:

- The Interior Province comprising the eastern flanks of Lebanon's range, the Bekaa Valley and the western flanks of Anti-Lebanon;
- The Mediterranean Province comprising the western flanks down to the sea.

The line that divide between these two basins is been considered as a fictitious line passing through the tops of Mount Lebanon, Mount Barouk (Jabal Al Barouk), Jabal Niha and the Lebanese Galilee. In both Provinces several basins were identified.

The physical characteristics of these aquifers/basins are expected to remain the same since the initial studies (1970s) were conducted, much of the hydrological and hydraulic properties have changed due to uncontrolled groundwater tapping especially during the civil war (1975-1990).

The country's geological structure have further complicated the issue, as faults may act as barriers, flow paths for water divide the same basin into sub-basins

with different groundwater table levels. Furthermore, in karsts terrain (widespread in the country) the hydrology is different from other types of terrain where diffuse flow of water dominates. In karsts, water tends to concentrate along specific paths flowing in underground rivers and conduits until and through the phreatic (of or relating to ground water) zone, a phenomenon whereby the traditional concept of water table does not clearly apply resulting in the difficult task of delineating a general groundwater surface map, as well as the problem of a lack of data.

4.2.2 Water distribution and water consumption

Obviously agriculture is the largest consumer of water in Lebanon (as well as worldwide), followed by domestic and industrial uses. Many attempts made to estimate current water consumption in Lebanon in the past. It is very difficult to determine the actual breakdown of water consumption as large shares of water in public distribution systems are lost through leakages and private wells, most of which are unlicensed therefore not monitored. In general, agriculture represents between 60 to 70 percent of total water consumption. This consumption is likely to decrease in the future as more is diverted for domestic and industrial use (see table 4.2.d).

Table 4.2.d: Total water demand by sector

Usage type	1990		1994		2015	
	Mm ³ /Y	Percent	Mm ³ /Y	Percent	Mm ³ /Y	Percent
Agriculture	875	72	950	74	1,700	60
Domestic	271	22	205	16	900	32
Industry	65	6	130	10	240	8
Total	1,211	100	1,285	100	2,840	100

Source: LEDO, 2001

It is widely reported that current water consumption is around 1,400 Mm³. Demand forecasts are conflicting, ranging from 1,897 Mm³ to 3,300 Mm³ for the year 2010 (MoE/LEDO. 2001).

1) Domestic consumption: 79 percent of buildings were connected to water supply networks (Census of Buildings and Establishment for 1996-7). The highest rate of connection was recorded in Beirut and Kesrouan (93 and 94 percent respectively). It is important to note that some improvements have been made since, but there is no up-to-date information regarding this matter.

Water supply to households originates from surface or underground water resources. Most of the country's 15 potable water treatment plants existed before the

civil war and they were rehabilitated and some expanded. Between 1995 and 2001, average water treatment capacity increased by more than 50 percent (see Table 4.2.e). Even though it is difficult to estimate the current level of domestic water consumption, several sources indicate that the target capacity is 160 litres per day per person. Actual delivery is presumably much lower (around 64 litres per day in some areas), due to high system and distribution losses. Therefore, in addition to investing in production and treatment measures, the Government is increasingly focusing on reducing losses and improving distribution.

Table 4.2.e Distribution and capacity of Water Treatment Plants

Region	Water Board	Plant Location (Name)	Capacity (m ³ /day)	
			1995	2001
Greater Beirut	Beirut	Dbaye	230,000	430,000
	Ain Al-Delbe	Dayshounieh	50,000	50,000
		Hazmieh	50,000	50,000
North Lebanon	Tripoli	Haab	40,000	40,000
	Nabaa al-Ghar	Kousba	5,000	16,000
	Batroun	Nabaa Delleh	3,500	12,000
Mount Lebanon	Metn	Al-Marj Lake	3,500	3,500
		Jeita	16,000	17,000
	Jbeil	Nahr Ibrahim	4,000	16,000
South Lebanon	Saisa	Nabaa Kfarwa	8,500	8,500
	Nabaa Al-Tasse	Nabaa Azzibeh	4,000	4,000
	Sour (Tyre)	Al-Bass	6,000	12,000
		Ras Al-Ain	13,500	15,000
Jabal Amel	Taybeh	8,000	8,000	
Bekaa Valley	Zahle	Berdawni	10,000	10,000
Total	(12 Authorities)	(15 Plants)	452,000	692,000

Source: MoE/LEDO, 2001.

2) Agriculture consumption: Lebanon has significant water resources that could be used to more than double irrigated agricultural land and that it could export to its neighbours. Unlike its neighbours, it does not have to cope with areas of extreme aridity.

Agriculture in Lebanon is increasingly shifting to irrigated production, which adds pressure on water resources. Increased irrigation implies more groundwater

pumping, leading to salinity build-up in the soil. The agriculture sector is the largest consumer of available water resources. During the recent decades, irrigated lands have more than doubled, from 40,775 hectares in 1961 to 104,009 hectares in 1999 (FAO, 2000). The gradual substitution of traditional and wild cultivar (A variety of a plant developed from a natural species and maintained under cultivation) with new crop varieties constitutes an added pressure on water resources.

Water for irrigation is provided from both surface and groundwater (48 and 52 percent, respectively). The number of farms that have private water wells is believed to be increasing rapidly (many farms have more than one well), taking into consideration that there are no data on water wells to support this.

Furthermore, another concern with the expansion of irrigated agriculture is the high dependence on gravity irrigation. Gravity irrigation accounts for around 64 percent of the total irrigated land and is the predominant method of irrigation with surface water. Compared to sprinkler and drip irrigation, gravity irrigation inherently carries high water losses, due to low system efficiencies and high evaporation losses. While efficiency of gravity irrigation could be significantly improved using optimal water and crop management schemes, the majority of farmers in Lebanon lack of training in basic agriculture.

Government spending is moderate concerning this sector. Under the Irrigation Rehabilitation and Modernization Project (IRMP), partially funded by a World Bank loan, distribution schemes have been completed in Qassmieh/Ras al Ain (3,800 ha.), Yammouneh (5,600 ha.), Akkar al Bared (800 ha.), Dennieh (5,000 ha.) and the south Bekaa (2,000 ha.). These projects will cost an estimated US\$71 million and potentially will irrigate 17,200 hectares, which may be further expanded to 20,000 hectares. The most ambitious irrigation schemes to date is Canal 800 (ibid. 2001).

Canal 800 is a series of surface water distribution networks that will irrigate 15,550 hectares of arable land in South Lebanon, stretching from the Qaraoun Lake to the southern border with Israel. The main distributor (about 56 km.) originates at the Taybeh pumping station (from a derivation of the Litani River). An additional 56 km of secondary distribution lines bring the total length to 112 km. The target area is divided into 12 irrigation zones distributed across the "Cazas" of Mareayoun (two zones covering 2,569 hectares), Nabatiyeh (one zone covering 1,750 hectares), and South Qassmieh (nine zones covering 10,916 hectares).

Canal 800 is designed to supply irrigation water at the rate of 6,600-7,000 m³ per hectare per season. The project is expected to cost an estimated US\$100 million, to be funded partly by the Arab Fund for Social Development (AFSD). Originally an old project design, the feasibility study for Canal 800 is currently being updated and detailed designs are under preparation. Execution of Canal 800 (main distributor, irrigation networks, land levelling) will require at least 10 years.

Canal 800 and the IRMP will add 32,255 hectares to irrigate agriculture. These irrigation schemes are designed to tap surface water resources and may alleviate current demand pressure on groundwater. However, excessive diversion of surface water could reduce base flows further thereby affecting freshwater habitats. This may alter floral association and faunal populations in freshwater bodies.

Moreover, improvement to the irrigation infrastructure in Lebanon must be accompanied by improved water management, as agriculture accounts between 60 and 70 percent of total water consumption. (FAO. 2000)

4.2.3 Other uses of water

Mainly two types of water uses:

- Hydropower plants: Several rivers have been dammed to generate electricity, starting as early as the 1960s. Due to the reliance on water gradients (and many other reasons; political, religious, etc.) there are little interest in expanding existing hydroelectric plants or even building new ones. Recently the government has invested significant resources to capture snow water at high altitudes to sustain agriculture production during the dry season (summer period). This is further discussed in sub-section 4.3.3, part 1 Dams and reservoirs;
- Recreational use: Swimming pools that mainly are for private use (villas, hotels and country clubs) and are presumably tapped from underground water resources at liberty. Water parks also are considered as heavy water consumers and not monitored as well private swimming pools.

4.3 Freshwater Management

Lebanon's water supply and irrigation networks are in less than average shape, and a considerable amount of precious water is lost every year. Although donors, in particularly from Arab States, have given over \$600 million since the end of the civil war in loans and grants to rebuild the water network, much of which dates

back to the French mandate, the 2001 US AID study estimated that 50 to 70 percent of the distribution systems still need to be rehabilitated. Water losses exceed 50 percent in many areas. Overuse of wells in coastal areas has lowered water tables and caused saltwater to intrude into the coastal aquifers (LEDO. 2001)

Much of the country's irrigation system dates from before the civil war (before 1975), and cracks in canals, evaporation, and illegal use of canal water account for irrigation efficiency of 30 to 40 percent, according to the AID study. About 80,000 to 90,000 hectares are irrigated every year, out of a potential 180,000 hectares. Donors have pumped about \$60 million into irrigation systems since the early 1990s. USAID has given \$1.9 million in grants for 89 potable water projects and \$3.9 million for 189 irrigation projects over the past decade.

In addition, the management of Lebanon's water resources is poor. ESCWA estimates that only 40 percent of Lebanese pay for their water. Except for Sidon (Saida), water systems are not metered and customers are charged a flat fee. In Beirut, water users, both domestic and commercial, pay about \$153 per year, which provides no incentive to save water. Although water tariffs in Beirut have increased more than 40 percent since 1994, revenues cover less than 70 percent of operating costs, according to the 2001 AID study.

Water shortages should not be commonplace in Lebanon given that the country is blessed with plentiful rainfall in the winter. There are many reasons for this shortage that are related to poor water management, however, the fundamental problem is that more than half of the rainwater flows unexploited into the sea. The government is trying to do something about it.

According to the ministry's 10-year plan, one of the objectives is to transfer the full cost of providing water supply and sewage disposal services from the state to consumers through an equitable tariff and collection system. This, however, may prove problematic. None of the water authorities, with the exception of the Sidon Water Authority, have domestic water meters installed and charge on a volumetric basis. In addition, since municipal supplies are irregular, there are a huge number of private wells in the country that are not monitored. As a result, people feel water is something that is practically free.

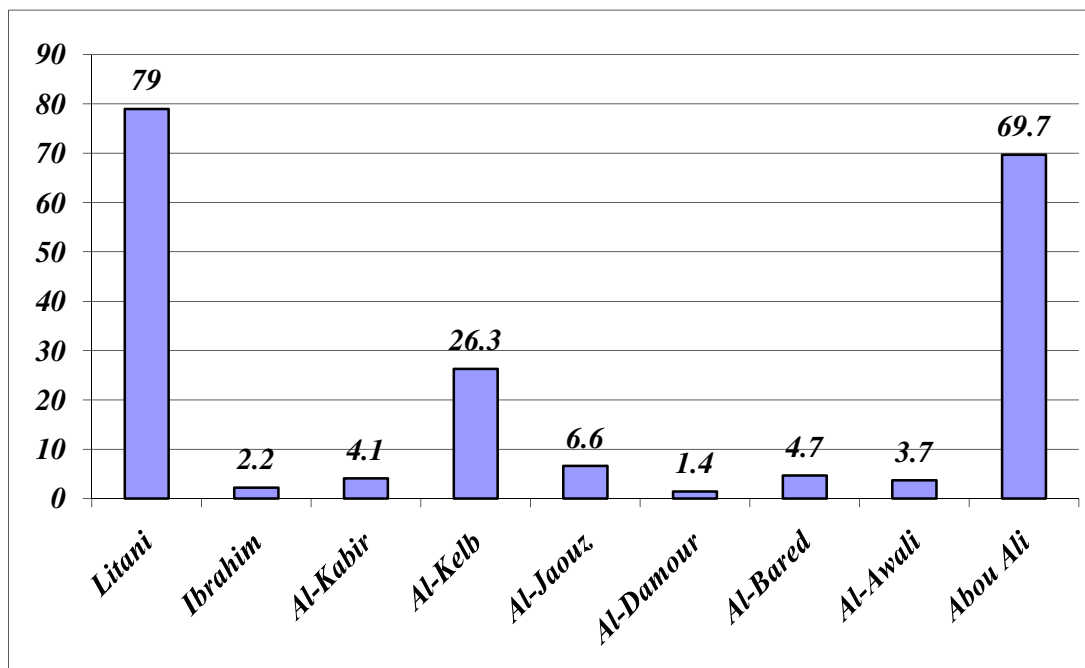
4.3.1 Water quality

Industrial activities releases a wide range of chemical effluents into water courses, especially surface and coastal waters, not to mention leaching of pesticides

and fertilizers from agriculture. It is difficult to estimate the pollution loads into water bodies from various sectors. Not only data on effluent generation from industry are scant and poorly monitored, there is also insufficient data on effluent disposal routes; i.e. direct discharge on land or into nearby water courses and the Mediterranean Sea, indirect discharge into sewer networks with or without pre-treatment.

1) Surface and underground water quality: In general water quality data are available from indirect sampling activities conducted by various institutions (National Centre for Marine Sciences, Ministry of Public Health/Directorate of Central Laboratory, American University of Beirut Water Resources Centre, Ministry of Energy and Water). Such data highlight spatial variations but do not account for temporal variations, which require continuous sampling and monitoring events (something Lebanon does not have).

Figure 4.3.a: Level of BOD₅ in nine Rivers



■ Mean recorded values for BOD₅ (mg/l)
Source: ECODIT, 2001, p. 118.

Water bodies are affected by effluents and solid waste from about 22,000 industrial establishments, not to mention the domestic effluent from the whole population (around four millions). It is estimated that domestic effluent reaches

around 249 Mm³ per year while previous reports estimated industrial effluents at about 22.3 Mm³ per year (ECODIT. 2001).

A study conducted by American University of Beirut Water Resources Centre, November 1999, assessed the impact of waste disposal on water quality in nine major rivers. The results of water and sediment samples from 65 separate sampling sites showed generally high concentrations of BOD₅ (The biochemical oxygen demand of wastewater during decomposition occurring over a five day period; a measure of the organic content of wastewater, up to 154 mg/l at certain sites), as well as fecal and total coliforms [a group of bacteria which live within the bowels of larger organisms and ferment a sugar called lactose, producing gas within 48 hours of growth. They are generally small, gram-negative, bacilliform (shaped like rods) facultative anaerobes and they include strains such as *Kelbsiella*, *Enterobacter*, and *Citrobacter*. They are useful for measuring the amount of water pollution by feces (Figure 4.3.a)]. High BOD₅ levels and coliform counts indicate that untreated domestic sewage is directly discharged into water bodies.

Another study prepared for the Ministry of Environment and the Litani River Authority by MVM (Swedish based company) between November 1998 and May 2000, reveals that currently up to seven sewer networks of varying sizes discharge their effluents into the River. Baalbek, Houch Al-Rafqa, Qaa er Rim, Zahle, Chtoura, Qabb Elias, Bar Elias, Joub Jannine and Qaraoun discharge untreated sewage into the Litani or its tributaries.

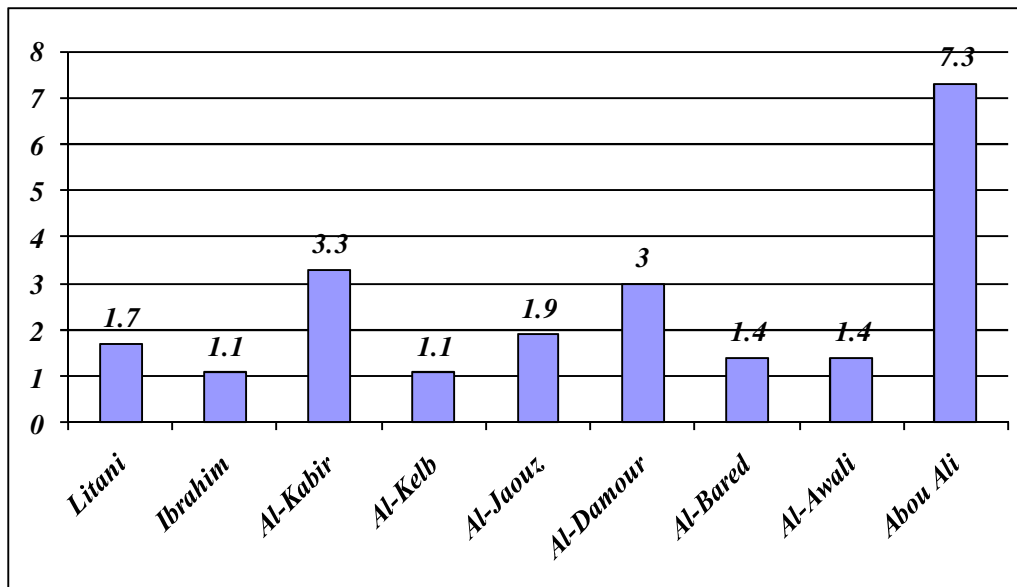
The River also receives industrial effluents from sugar-beet factories, paper factories, lead recovery plants, limestone crushers, agro-industries and poultry farms, tanneries and slaughterhouses.

The study also found that the dump releases significant amounts of hydrocarbons and chlorinated organic substances including alkyl naphthalene and non-polar carbons. The impact of open dumping at Zahle open dump (along the Berdawni River) was assessed, the results showed that heavy metal concentrations, including zinc, copper and nickel, were significantly higher downstream of the open dump (ibid. 2001).

This River is also affected by leachate [the liquid produced when water percolates through any permeable material. It can contain either dissolved or suspended material, or usually both. This liquid is most commonly found in association with landfills where result of rain percolating through the waste and

reacting with the products of decomposition, chemicals and other materials in the waste to produce the leachate. If the landfill has no leachate collection system, the leachate can enter groundwater, and this can pose environmental or health problems as a result. Typically, landfill leachate is anoxic, acidic, and rich in organic acid groups, sulfate ions and with high concentrations of common metal ions especially iron. Leachate has a very distinctive smell which is not easily forgotten.

Figure 4.3.b: Level of NO₃ in nine Rivers



■ Mean recorded values for NO₃ (mg/l)
Source: ECODIT, 2001, p.118.

The risks from waste leachate are due to its high organic contaminant concentrations and high ammoniacal nitrogen. Pathogenic micro-organisms and toxic substances that might be present in it are often cited as the most important, but pathogenic organism counts reduce rapidly with time in the landfill, so this only applies to the freshest leachate. These risks are greatly mitigated by properly designed and engineered landfill sites. For example, sites that are constructed on geologically impermeable materials or sites that use impermeable liners made of geotextiles or clay.

The use of linings is now mandatory within both the United States and the European Union except where the waste is genuinely impermeable. In addition, toxic materials such as cadmium and toluene cannot be disposed of in landfills] released from five open dumps (Baalbek, Sifri, Barr Elias, Zahle and Joub Jannine). Unlike

controlled landfills, which are equipped with basal lining systems to intercept leachate, open dumps release leachate directly into the environment. Leachate will seep into groundwater or runoff into nearby watercourse. These pollutants indicate the presence of pesticide residues in the dump, presumably caused by the disposal of agro-chemical wastes.

Figure 4.3.b presents mean recorded values for NO_3 [Nitrates such as potassium nitrate (saltpeter) and ammonium nitrate are important nitrogen carriers in fertilizers; lesser amounts of calcium nitrate, magnesium nitrate and sodium nitrate are applied. These nitrates must be used quickly by plants because they are easily lost through leaching or denitrification by bacteria. Nitrate pollution has become an environmental issue in rivers and oceans. In freshwater or estuarine systems close to land, nitrate can reach high levels that can potentially cause the death of fish. While nitrate is much less toxic than ammonia or nitrite, levels over 30 ppm (parts per million) of nitrate can inhibit growth, impair the immune system and cause stress in some aquatic species. In most cases of excess nitrate concentrations, the principal pathway of entering aquatic systems is through surface runoff from agricultural or landscaped areas which have received excess nitrate fertilizer. These levels of nitrate can also lead to algae blooms, and when nutrients become limiting (such as potassium, phosphate or nitrate) then eutrophication can occur. As well as leading to water anoxia, these blooms may cause other changes to ecosystem function, favouring some groups of organisms over others. Consequently, as nitrates form a component of total dissolved solids, they are widely used as an indicator of water quality] levels.

High Nitrates (NO_3) levels reflect the additional presence of diffuse sources of pollution, such as fertilizers from riverbank agriculture. Concentrations of total dissolved solids, chlorides, orthophosphates and sulphates varied from 17-464 mg/1, 8-85 mg/1, <0.1-1.72 mg/1, and 0.23-68 mg/1, respectively.

Lebanon does not have standards for surface water quality. Decision 52/1 (1996) does however provide minimum water quality standards for aquatic life, including several heavy metals such as Zinc and Copper. The corresponding limit value for both is 1 mg/1.

Limestone formation facilitates the seepage of liquid wastes to water underground. Point sources of pollution include the discharge of domestic and industrial solid and liquid wastes, as well as routine or accidental spills (leaking

underground storage tanks per example). Diffuse sources of pollution include mainly agrochemicals (pesticide residues and fertilizers) and seawater intrusion (water salinity).

The American University of Beirut conducted a preliminary assessment of underground water quality in Lebanon in 1999. A total of thirty one samples from thirteen different regions were analysed for the presence of sixteen pesticide compounds, including transformation products. The results showed that NO₃ concentrations were moderately high in the sampled wells, especially along the coast, ranging from 0.3 mg/1 in Niha to 51.9 mg/1 in Choueifat (ibid. 2001).

The Lebanese and the World Health Organization (WHO) standards in drinking water are 45 mg/1 and 50 mg/1 respectively. Generally, nitrate levels above 20 mg/1 indicate human-based pollution (not naturally occurring). Phosphate levels were within acceptable ranges (ibid. 2001). Pesticide residues were detected in trace concentrations:

- **Aldrin** (30 percent of the sampled wells): An organochlorine insecticide which is oxidized in the insect to form dieldrin, a neurotoxin. Aldrin was formerly used to kill soil insects such as termites and grasshoppers to protect crops such as corn and potatoes. It has been classified as a persistent organic pollutant. Due to health concerns regarding dieldrin, it is no longer manufactured or used in the United States. In addition, aldrin is itself a carcinogen and mutagen. The last American farm to use the pesticide was Emily Farms, in Covina, CA. It can be formed from the synthesis of hexachloro-1, 3-cyclopentadiene with norbornadiene in a Diels-Alder reaction;
- Dieldrin (12 percent): A chlorinated hydrocarbon originally produced by Bayer AG as an insecticide. The molecule has a ring structure based on naphthalene. Dieldrin is closely related to aldrin which itself breaks down to form dieldrin. Aldrin is not toxic to insects, it is oxidised in the insect to form dieldrin which is the active compound. Both dieldrin and aldrin are named after the Diels-Alder reaction which is used to form aldrin from a mixture of norbornadiene and hexachlorocyclopentadiene. Originally developed in the 1940s as an alternative to DDT, dieldrin proved to be a highly effective insecticide and was very widely used during the 1950s to early 1970s. Endrin is a stereoisomer of dieldrin. However, it is an extremely persistent organic pollutant; it does not easily break down. Furthermore it tends to accumulate

as it is passed along the food chain. Acute (short-term) exposure is considered to be harmless, but long-term exposure has proven toxic to a very wide range of animals including humans, far greater than to the original insect targets. For this reason it is now banned in most of the world;

- **Heptachlor** (12 percent): An insecticide that usually comes in the form of a white or tan powder, the tan powder being of lower purity. It is similar to insecticide chlordane. Heptachlor was widely used in the past to kill insects. In 1962, Rachel Carson's *Silent Spring* questioned the safety of heptachlor. The Environmental Protection Agency has banned the sale of heptachlor products in the United States and virtually eliminated its use for any purpose. Due to its highly stable structure, heptachlor can persist in the environment for decades. The amount that can be present in different foods is regulated;

- **Heptachlor epoxide** (9 percent): An oxidation product of heptachlor formed by many plants and animals, including humans, after exposure to heptachlor. It has been shown to remain in soil treated with heptachlor for over fifteen years and is toxic to animals and humans.

2) Seawater contamination, wastewater discharge and coastal water quality: Seawater contamination of underground water near the coast has been reported in Lebanon as early as the 1960s. This problem has reached a new scale of severity over the last two decades due to the rural-urban migration and also population growth. This increases demand for water all along the coast, and most particularly in and around the capital. Many new urban developments (housing and recreational resorts in mountain areas) rely on underground water supplies. In the absence of strict enforcement of borehole specifications and permissible abstraction rates, the salt-freshwater interface shifts inland.

Over-pumping leads to higher chloride concentrations in underground water. In 1997, almost 42,000 buildings (nine percent of all buildings in Lebanon) were equipped with private wells. Farmers across the country are suspected of having drilled countless number of more wells. A high sodium and chloride concentration in coastal underground water is attributed to seawater intrusion (ibid. 2001).

High chloride levels in mountain regions and in Bekaa Valley are potentially attributed to fertilizer applications and where demand for irrigation is increasing rapidly. Farmers are digging wells at liberty, defying the most basic well digging standards (permissible depth and minimum distance between wells).

Chloride concentrations were generally above the World Health Organization (WHO) and Lebanese permissible limit of 250 mg/l and 200 mg/l respectively. Sodium concentrations were well above the 200 mg/l WHO standard and 150 mg/l Lebanese standards for drinking water (sodium levels exceeded 5,000 mg/l in some wells).

Another study conducted by the AUB Water Resources Centre in 2000 shows, in addition to trace levels of several pesticides, high concentrations of nickel, copper, chromium, lead and arsenic at several locations along the coast. Currently, there are about 53 wastewater outfalls along the coast (ibid. 2001). Coastal waters are also affected by countless beachfront resorts, numerous reclamation and sea embankment projects (new sea runway at Beirut International Airport and Dbaye Marina).

Some 2.3 million people live in the coastal zone. They release approximately 950,000 m³ of wastewater a day, most of it ending up in the sea (CDR/ECODIT (a worldwide, water and environmental management and international development consulting firm) - IAURIF (French Institut d'Aménagement Urbain de la Région d'Ile de France), 1997). Of the 10 coastal areas monitored by the National Centre for Marine Sciences, only one station (Batroun) was deemed fit for swimming based on the concentration of fecal coliform. All other nine areas exceeded the WHO fecal coliform standard for recreation waters.

Furthermore, solid waste disposal in beachfront dumps continues in Tripoli and Saida, but has stopped in Normandy and Bourj Hammoud. Disposal of solid waste in uncontrolled landfills and waterfront dumps exacerbate the current pattern of seawater contamination.

In the absence of clay or plastic liners, leachate seeps into underground water and seawater resulting in both organic and inorganic contamination. In addition to the release of leachate, coastal open dumps are also the source of drifting debris and floating waste, which may sink to the bottom and cover the sea floor.

The Professional Divers' Association (PDA) frequently reports that the waste covers the sea floor at many locations off the coast, reducing photosynthesis and suffocating marine flora and fauna. Fishers report the gradual decline of the coralline reefs. Frequently observed, waste includes cans, tires, plastic materials, etc. (ibid. 2001)

3) Drinkable water quality: Water is either chlorinated directly at the source or treated at a centralized water treatment plant. Regional water authorities are responsible for procuring, treating and distributing potable water to households. Potable water quality may deteriorate during distribution (rusting water conduits, cross contamination by wastewater network, etc.). Therefore, it may not be safe for consumption to end-users, potentially leading to incidences of gastro-intestinal diseases (e.g., diarrhea, dysentery) and other infectious diseases (e.g., typhoid, hepatitis).

The Directorate of Preventive Medicine reveals (published at the MOPH between 1995 and 2000) that the annual number of cases of dysentery, hepatitis A and typhoid (leading types of water-borne diseases in Lebanon) has declined (see Table 4.3.a) in some areas (Beirut, South and Nabatiyeh). Bekaa and North Lebanon have experienced a sharp increase in the incidence of all three water-borne diseases.

Table 4.3.a: Case of Reported Water-Bourne Diseases in Mohafaza (1995-2000)

Reported diseases	Mohafaza						
	Beirut	Mount Lebanon	North Lebanon	South & Nabatiyeh	Bekaa	Unspecified	Total
<i>Year 2000</i>							
Dysentery	5	17	69	5	245	13	354
Hepatitis A	20	12	135	19	36	17	239
Typhoid	32	110	371	45	140	31	729
<i>Average for years 1995-2000</i>							
Dysentery	9	47	24	314	68	18	471
Hepatitis A	35	39	84	86	22	20	286
Typhoid	47	86	294	230	99	42	795

Source: MoE/LEDO, 2001.

4.3.2 Water pollution; Economic impact, policies and actions

A major problem for those managing Lebanese water availability and demand is the lack of accurate and reliable data. This condition has two sides:

- During the civil war hardly any research was carried out or data collected;

- Because of the regions' geopolitical situation, official reports are often false and subject to manipulation.

Under Lebanese law, water is considered as a public good. Water is subject to a set of regulations that have their roots in the civil law as well as in administrative law. In favour of the administration, the Lebanese legislator mentioned that all waters in Lebanon belong to the public domain.

Hydrological metering and information collection in Lebanon goes back to the mid-1960s. However, the application of such information for scientific use was then very limited. Such metering required a heavy investment to be made in a public sector domain. In the early 1970s the "Direction Générale des Statistiques" began collecting hydrological data but its work was interrupted by the political events following the crisis in 1975.

In the early 1980s some isolated action took place such as the report published by the Water Authority in Beirut. Towards the end of 1980s the Council for Development and Reconstruction launched a series of local studies.

Lebanon has not developed a countrywide database of water quality, though the UNICEF reported that 60 to 70 percent of water resources are contaminated (ibid. 2001). High level of nitrates and phosphorus from agrochemicals contaminate surface water. Major pollutants of surface water and groundwater are untreated municipal wastewater. Most sewer systems are damaged or operating over capacity.

Potable water networks are frequently polluted by wastewater infiltration. The only operating wastewater treatment plant is the Ghadir plant designed to serve 300,000 people. Some 35 Mm³ of untreated industrial effluent is discharged each year into the Mediterranean, Qaraoun Lake, and the Litani and the Berdawni Rivers.

Waterborne diseases are one of the leading causes of mortality among children less than five years old. Health problems resulting from exposure to water pollutants often result in health care expenditure as well as absence from work. In addition to this health impact (a major concern in Lebanon), poor water quality increases the costs of water treatment and encourages people to spend more on bottled water.

A report presented to the Ministry of Energy and Water (MEW) by ECODIT in 2001 shows that the costs of the health impacts of water pollution is at US\$ 7.3 million per year and the costs of excess bottled water consumption at about US\$ 7.5

million per year. The methodology used to estimate these costs always relies on very conservative estimates.

Table 4.3.b: Estimated Annual Costs of Excess Mortality due to Water Pollution in Lebanon

Cost Category	Premature mortality	Hospital admissions due to diarrhea diseases			Emergency room visits	Restricted activity days	
		Dysentery	Hepatitis A	Typhoid			
No. of persons or cases	69	132	72	202	378	13,133	
Cost per person (US\$)	88,573	900	1,750	2,800	76.04	29.4	
Total cost (US\$)	6,111,537	118,800	126,000	565,600	28,743	386,110	7,336,790

Source: ECODIT, 2001.

Table 4.3.b shows the estimated costs on public health, including excess mortality due to unsafe water supply. As previously mentioned, poor water quality also encourages people to buy more bottled water than they would normally buy if they had access to clean and good quality drinking water.

According to a survey on household budgets, bottled water represents 0.6 percent of average annual expenses. By comparing local consumption with typical per capita consumption rates in select Mediterranean countries, it was estimated that Lebanon's excess consumption due to water pollution is 7.6 litres per capita per year.

In addition, water pollution results in many other hidden costs that are more difficult to quantify. Therefore, the costs presented in this report tend to underestimate the actual and real costs of water pollution and should be used as a starting point for more thorough economic evaluation based on new information that may become available in the future.

The following three sections will highlight key policies and actions to reorganize the water sector in Lebanon.

1) Institutional developments: The MEW that supervises autonomous water authorities and is responsible for water management developed a 2000-2009 water strategy. The strategy addresses: Dams and aquifer recharge, potable water

projects, irrigation projects, wastewater treatment plant construction, and prevention of river flooding.

The Water Organization Law No. 221 of May 2000 created five water agencies for Beirut, northern Lebanon, southern Lebanon, southern Beqaa, and northern Beqaa. Also provided, a two-year transitional period, for reorganizing the existing water boards into regional water authorities.

Law No. 241 (29/05/2000) reorganized the existing 22 water boards into four Regional Water Authorities. The Litani River Department (LRD) is the only water authority to retain special responsibilities and functions that extend beyond its administrative region (natural boundaries of the Litani River watershed). The LRD continues to be responsible for developing and manage irrigation water associated works in the southern Bekaa Valley and South Lebanon.

Ministry of Environment protects the environment, conducts studies on wastewater treatment, permits the establishment of classified organizations, and enforces legislation.

Ministry of Public Health established a Department of Sanitary Engineering to monitor water quality, and also sets standards for drinking water, proposes specifications for wastewater and drinking water networks, recommends action for pollution prevention, and operates water quality equipment such as chlorinators.

Other organizations include:

- Ministry of Interior and Municipal Affairs supervises municipal works including sewage and drainage infrastructure.
- Council for Development and Reconstruction (CDR): responsible for water, wastewater and solid waste facilities.
- National Council for Scientific Research conducts and coordinates scientific research and contain an environmental division responsible for pollution, marine biology, and waste, wildlife, and nature reserves.

2) Overview and spending: CDR awarded 192 contracts worth a total of US\$ 409.2 million in the water supply sector (ECODIT. 2001), between January 01, 1992 and December 31, 2000. By March 2001, 60 percent of these projects were completed. More than 95 percent of the total contract values are capital costs, almost four percent are technical assistance contracts and less than one percent is operation and maintenance contracts.

Under the National Emergency and Rehabilitation Program I (NERP), the water supply networks of 19 water boards were rehabilitated and/or upgraded, including at least eight treatment plants, about 280 pumping stations, reservoirs and distribution systems. NERP I was financed by the World Bank.

NERP II, financed by the Kuwaiti Fund for Arab and Economic Development (KFAED), will rehabilitate and expand the water supply networks in the GBA. Under NERP II, the capacity of the Dbaye water treatment plant was extended to 430,000 m³ per day at a cost of US\$ 5.7 million, it will further expanded by 70,000 m³ per day. 16 water supply projects were under execution by March 2001 and 13 others were under preparation.

3) Water pricing: Subscription fees for domestic water supply vary among water boards; the law gives regional water authorities the power to set and collect water tariffs for domestic and agriculture use. During year 2001, tariffs ranged from LBP 65,000 per year to LBP 231,000 per year for a 1m³/day gauge subscription (this tariffs include 10 percent municipal surcharge). The existence of differences due to water availability and distribution costs as gravity distribution is the cheapest, while distribution by pumping is far more expensive.

Table 4.3.c: Water Tariffs for selected regions between 1996 and 2001

Region	In thousand LBP for annual subscription of 1m ³ /day					% Increase*
	1996	1997	1998	1999	2000	
Akkar	100,000	100,000	134,100	134,100	160,100	60
Baalbeck-Hermel	110,000	132,000	132,000	132,000	132,000	20
Barouk	110,000	110,000	121,000	152,000	152,000	38
Beirut	158,400	158,400	182,160	200,500	230,500	46
Bsharre	65,000	65,000	65,000	65,000	65,000	0
Dinniyeh	75,000	75,000	75,000	75,000	75,000	0
Metn	127,100	152,800	180,600	210,100	231,100	82
Saida	99,000	115,000	147,000	148,000	148,000	49
Tripoli	132,000	132,000	132,000	132,000	165,000	25

Source: ECODIT, 2001, p.127.

* Percent increase 2000 - 1996.

Table 4.3.c presents the increase in water tariffs between 1996 and 2000. Based on these tariffs, households are paying the equivalent of US\$ 0.12/m³ to US\$ 0.42/m³ of water (according to World Bank report in 1995, the average tariff in Israel

for urban drinking water is US\$ 1/m³). In fact, most households end up paying much more on a per cubic meter basis, two reasons:

- Frequent and periodic water shortages (some areas report receiving water only a few hours per day), which oblige households to buy water from private water distributors (between US\$ 5 and US\$ 10/m³).
- Secondary residences (many have another house in their villages, used only during summer season as a get away from the hot and humid weather in the coastal areas) pay the full annual water subscription tariffs even though they use the residence only for a few weeks or months during the year.

As long as water meters are not installed, the price of water will remain unaffected by actual water consumption and people will pay the same yearly amount regardless of the quantity of water actually delivered and consumed. This leads to the conclusion that people have no incentives to conserve water and waste is more common.

4.3.3 Potable water projects

In July 2002, the French Development Agency (Agence Francaise du Developpement, AFD) and the GoL signed a 10-year \$12 million loan agreement to rehabilitate water networks and build water reservoirs in the southern Nabatieh and Hasbaya districts. As part of the agreement AFD will also provide an assessment of the water sector in South Lebanon and prepare tender documents for a private company to manage the new South Lebanon water authority.

Work is about to start on a US\$2 million AFD project to renovate water networks and build seven water reservoirs in Jezzine district. In the north, AFD has offered a US\$20 million loan to repair water distribution systems in Tripoli and to improve the management of the local water authorities that will be merged into the North Lebanon water authority.

President Lahoud, on August 2002, laid the cornerstone for a US\$3.5 million drinking water project in Metn funded by the Kuwait Fund for Arabic Economic Development (KFAED). Meanwhile, a US\$35 million Japanese-funded project is replacing pipes and building reservoirs in Kesrwan district.

1) Dams and reservoirs: The irrigation potential in Lebanon is linked to the physical mobilization of water and to the rehabilitation and modernization of irrigation infrastructures. An increase in the irrigated area can be achieved from surface water resources through the construction of storage dams and interregional transfers, for

example the Khardalé dam over the middle Litani river (now postponed) and the “Canal 800” (see 2.2.2 Agriculture consumption) conveyor for the irrigation of more than 15 000 ha in South Lebanon. More than 83 sites for possible dam construction, with a total capacity of 873 Mm³, have already been prospected and are recommended for further investigation. (FAO. 1997)

Lebanon has only one major dam, on the Litani River at Lake Qaroun, with storage of 220 Mm³ and an effective storage of 160 Mm³ from year to year. It regulates the downstream flow of the Litani River for power generation and irrigation. The Bisri dam on the Awali River is currently at the final design stage for a storage capacity of 128 Mm³ and is intended mainly for supplying water to Greater Beirut. The Kardalé dam on the middle reach of the Litani River, also to give a storage capacity of 128 Mm³, has been postponed at the preliminary design stage, due to the situation in the southern border region. (ibid. 1997)

The Green Plan, which is a public authority established in 1963, responsible for the development of water reservoirs, and the private sector have already developed hundreds of small earth and concrete storage ponds, with a maximum per unit capacity of 0.2 Mm³. During the period 1964-1992 the Green Plan produced a total of 3.5 Mm³ of earth ponds and 0.35 Mm³ of concrete ponds. The Litani River Authority implemented three hillside stock ponds in the early 1970s for a total storage capacity of about 1.8 Mm³. (ibid. 1997)

In a ceremony, August 2002, President Lahoud inaugurated construction of a US\$42 million Shabrouh Dam in Faraya that will serve Kesrwan and Metn Districts. The districts currently have only a daily water supply of 24,000 cubic meters, according to press (Naaman. 2002). The dam, which is built by a French-Lebanese consortium, takes two to three years to build and have a capacity of about eight Mm³. It more than doubles the region’s water supplies.

Energy and Water Minister Beydoun said, at the same ceremony, that Shabrouh dam was the first of 30 dams and artificial lakes the GOL envisions building in order to store 800 Mm³ of water a year. Work also started on a US\$5 million 500,000 m³ dam at Qaisamani to provide drinking water to the Metn district and a US\$7 million 1.5 Mm³ dam at Yammouneh, near Baalbek, to provide irrigation.

Funding for both these projects is from the MEW’s budget, according to MEW Director General Mr. Fady Comair. The Kuwaiti Fund has offered a US\$30 million

loan to finance two additional dams in the Metn at Habbache and Boqatta, according to the Council for Development and Reconstruction.

Also an agreement signed with Syria in April 2002 for the joint construction of a US\$100 million dam on the El-Kabir River, which marks Lebanon's northern border with Syria. The dam is expected to store 70 Mm³ of water, of which Syria will use 60 percent and Lebanon the remainder.

2) Projects for the Orontes River: The 610-km long Orontes starts near Hermel and runs northeast about 16 kms before crossing into Syria, which has built four dams on the river, and then Turkey before emptying into the Mediterranean. A 1994 Syria-Lebanon agreement on use of the Orontes' waters allots Lebanon 80 m³ from the river's average annual flow of 400 m³. Lebanon currently uses only a quarter of this, however, to irrigate about 500 hectares along the banks of the river, according to the MEW.

According to NGO Cooperative Housing Fund (CHF) working in the region, there are virtually no other irrigation activities between Baalbek and Hermel. With help from a US\$90,000 US AID grant, however, CHF completed a US\$200,000 small (17,000 cubic meter) lake near Qamouha that is providing irrigation for 150 hectares.

Syrian President Hafez Assad agreed to a dam on the Orontes during his visit to Lebanon (March 2002), and the MEW followed up by enlisting a British company (finished a study for the GOL of a potential dam and irrigation project on the Orontes River in the northern Bekaa) to begin work on the one-year study. According to the MEW, the proposed US\$120 million project would build a 30-40 Mm³ capacity dam that would be used primarily for irrigating 6-7,000 hectares (of a potential 30,000 hectares) near Qaa and Hermel.

The dam also would likely generate 15 to 20 megawatts of electricity. MEW DG Comair mentioned in May 2002 that the dam also could supply 10,000 cm of potable water to Hermel. The dam is likely to be built about four kilometers from the river's source and two kilometers southeast of Hermel. (Naaman, T. 2002)

4.3.4 Litani River Plans

The Litani rises in the central Bekaa, runs southwest through the valley, turns west near Marjeyoun and makes a run for the coast north of Tyre. The GOL in the 1950s built a dam on the river in the southern Bekaa creating Lake Qaroun. The 51-km lake has a capacity of 220 Mm³ (less than half during the dry summer season) and provides limited irrigation and power to villages near the lake. With a US\$7

million loan from the World Bank, the Litani Water Authority completed the first phase of the Bekaa Irrigation Project, which will provide, when finish, water for 2,000 hectares nearby.

A US\$40 million second phase aims to irrigate 6,700 hectares, and a World Bank team finalized loan details with the GOL in the Spring of 2002. The head of the Litani Water Authority Mr. Nasser Nasrallah mentioned on March 2002 that unlike prices for potable water across the country, the Litani Authority has an irrigation water-pricing scheme that rewards conservation by charging farmers lower fees for adopting more efficient drip irrigation.

Even more ambitious than the Bekaa Irrigation Project is the US\$460 million Litani Water Project, which will bring water to 99 villages and thousands of hectares of agricultural land in the south. Kuwait and the GOL signed in January 2002 a US\$65 million loan agreement to help finance the US\$220 million first phase of the project.

The Arab Development Fund is to provide a \$100 million loan, and the GOL is committed to coming up with US\$55 million. When completed, the Litani River Project is expected to provide 90 Mm³ of water annually to southern farms and 30 Mm³ of potable water to the region. Seventy percent of the project will be in areas that were under Israeli occupation, and the project will employ 7,300 persons said Mr. Nasrallah. (ibid. 2002)

4.3.5 towards sustainable water management

On 2001, an environment report explained that despite seemingly abundant water resources, *“Lebanon is poised to experience a water deficit within the next 10-15 years, unless sound and radical water management policies are developed and implemented. Water stress in neighbouring countries including Syria, Jordan, Israel, West Bank and Gaza Strip is a harsh reminder that Lebanon must rethink its water strategy in the shortest delay possible, protect water resources and use them more judiciously”*. (LEDO, 2001)

Lebanon’s water supply problems are worsening, Lebanon’s population was about 4 million in 2001 with annual increase of approximately 1.65 percent (ibid. 2001). Lebanon possessed 766-1,287 m³ renewable water resources per capita (as of 1997). Those numbers are projected to decrease to 336-979 m³/capita by 2015 and 262-809 m³/capita by 2025. This means that it will be unable to meet its local demand by 2025. In 1994, total water demand in Lebanon was 1,285 Mm³ per year,

of which 74 percent was used by agriculture, 16 percent for domestic consumption, and 10 percent by industry. (ibid. 2001)

Furthermore, water resources in Lebanon are believed to be particularly vulnerable to climate change due to Global Warming (flooding and desertification), since it is located at the border of desert regions and more than 60 percent of its economic activities lie in a narrow coastal plain along the Mediterranean Sea. (Bou-Zeid and El-Fadel, 2002)

A 10-year plan for the years 2000 till 2009 was introduced by the MEW, which has initiated several programs to better manage Lebanon's water resources. This plan is being divided into two 5-year plan.

Table 4.3.d presents the five main components of this plan. It is considered as the first step towards proper, sustainable and comprehensive water management. This plan has five main components, four of which tackle water issues the fifth relates to electric infrastructure, the largest share that represents nearly two-thirds of the budget was allocated to procure additional water resources.

Such infrastructure investments intend to alleviate water shortages by increasing water supplies also is potentially an economic as well as an ecologic burden on society. Efforts should be committed to improve water efficiency (water metering, lifting illegal connections, introducing on-farm practices for the efficient use of irrigation), and securing alternative water resources, such as treated wastewater.

Table 4.3.d: Budget Appropriation for 10-Year Plan

<i>Component of 10-Year Plan</i>	<i>Percentage of Budget allocation</i>
<i>Procurement of additional exploitable water resources</i>	<i>66.7</i>
<i>Potable water supply projects</i>	<i>15.7</i>
<i>Irrigation schemes and wastewater plans</i>	<i>9.8</i>
<i>Assessment of river basins & their protection from pollution and flooding</i>	<i>5.1</i>
<i>Electric infrastructure</i>	<i>2.7</i>

Source: MoEW, 10-Year Plan.

Note: The total budget allocated is US\$ 850 Million, equals to US\$ 212.5 per capita (assuming a population of 4 million).

In the absence of an overall strategy, the government is pursuing a piecemeal approach:

- Taking into consideration the fact that Lebanon is in a fortunate hydrological position, also has perfect geological formations, and despite plans to construct up to 30 new small dam systems only four proposed dams are being explored;

- While the government has been advocating private sector participation in many sectors including water, many factors prevent this participation such as lack of written policies and action plans, an inadequate legal framework, unclear procedures for creating and sustaining public-private partnerships. Actually, isolated efforts have been made; management contract with a private operator in the city of Tripoli and considering other arrangements supported by the World Bank in Baalbeck.

In addition to the less than expected achievements made, strategy for improvement should be taken into consideration. The following is a list of some of the actions needed to bring Lebanon's water management capabilities into the 21st century:

- Develop a water quality management strategy to accompany the water strategy and integrated action plan for water quality management that includes the private sector;

- Review the existing legal and regulatory framework and develop additional legal texts. Review existing standards of enforceability. Pass the pending environmental law and environmental impact assessment laws. Upgrade and update the skills and other capacities of staff;

- Improve water quality monitoring including reconnaissance surveys of the status of water quality and the sources of pollution, identify the country's laboratory requirements, and develop a sustainable cost-effective monitoring program (this should be done with the aim of improving water delivery and reducing water loss, which will also protect groundwater from wastewater contamination);

- Establish a self-monitoring and compliance program for industries. Plans should be overseen and enforced by the Ministry of Environment;

- Develop and implement a program for strengthening national capacities in water quality management including water resources management, wastewater management, operation and maintenance of treatment plants, wastewater reuse, database creation and updating, information dissemination,

community participation, monitoring and enforcement, and new economic measures such as “Polluter Pays”. Strengthen management in order to develop more efficient use of limited financial resources. (Stronger management is likely to be an efficient way to collect water subscription fees);

- Update hydrological maps at a scale of 1:2500000, showing major catchment’s areas, drainage lines, and patterns, rivers, lakes, and other major and minor water bodies, as well as rainfall distribution patterns;
- Produce hydro geological maps at a scale of 1:2500000, showing groundwater flow patterns, water-quality levels, aquifer boundaries, existing development, and areas for potential future development. (Drawing these maps can be done with the help of very useful relevant data obtained from meteorological satellites, Landsat Multispectral Scanners [The human eye has three colour receptors for red, green and blue. Multi-spectral images are images that are taken with additional receptors sensitive to other frequencies of the visible light, or to frequencies beyond visible light, like the infrared region of electromagnetic continuum. This can allow extracting additional information that the human eye fails to capture Multi-spectral images are the main type of images acquired by Remote sensing (RS) radiometers. Multi-spectral is the opposite of panchromatic. Usually satellites have 3 to 7 or more radiometers (France's SPOT has 3, Landsat has 7). Each one acquires one digital image (in remote sensing, called a *scene*) in a small band of visible spectra, ranging 0.7 μm to 0.4 μm , called red-green-blue (RGB) region, and going to infra-red wavelengths of 0.7 μm to 10 or more μm , classified as NIR-Near Infrared, MIR-Middle Infrared and FIR-Far Infrared or Thermal. In the Landsat case there are 7 scenes comprising a 7 band multi spectral image], and other such devices. There is, however, no substitute for land surveys, which provide, among other things, human field confirmation of technologically gathered data).

4.4 Wastewater Management

An unfortunate and seemingly inevitable outcome of modernization and industrialization is pollution. The contamination of water resources is being a major concern to the Lebanese environmentalists. While wastewater could potentially increase supplies for irrigation, indeed it could also add plant nutrients such as

nitrogen and phosphate. The majority of wastewater outlets are in rivers, intermittent streams, etc., and they are contaminating the ground water quality; a big portion is discharged into the sea.

Lebanon generates approximately 249 Mm³ (65,800 MGY) of domestic wastewater, up from 165 Mm³ per year (43,000 MGY) in 1991. In addition, industry generates an estimated 43 Mm³ of wastewater per year. In the absence of waste surveys and industrial production statistics, it is difficult to estimate the composition of industrial wastewater. In 1991, the quantity of treated wastewater was roughly estimated at 4 Mm³ per year (1,000 MGY) and the quantity reused at 2 Mm³ per year (530 MGY), less than 2 percent generated. (LEDO, 2001)

4.4.1 Collections, Treatment and Disposal

Wastewater management requires adequate collection and treatment of wastewater, and disposal of treated effluent and sludge. The untreated wastewater infiltrates from cesspools to groundwater or flows directly from sewer pipes to the natural watercourses. Significant improvements are being made to the sewer network, though little has been achieved in terms of wastewater treatment. Clearly, wastewater in Lebanon represents both an immediate public health concern and vast untapped resource.

UNICEF estimated in a 1996-97 report that some 10 percent of wastewater is used untreated in agriculture irrigation. About 37 percent of nearly half-million buildings in Lebanon were connected to sewers in 1997. The remaining buildings (around 63 percent) either use cesspools and septic tanks or simply release raw sewage directly into the environment, including rivers and streams, dry river beds, and underground (through dry wells). (ibid. 2001)

Since 1997, extensive wastewater works have been achieved, which has presumably improved the wastewater collection capacity. The current extent of buildings connected to sewer networks is not known, but presumably higher than 1996-97 levels.

Wastewater from Beirut as well as parts of the Cazas of Metn, Baabda and Aley is collected and transported to two main coastal collectors:

- The northern collectors comprise two lines and extend over 17 Km, and are designed for a future population of 891,000 people (CDR, 2001). Works on these collectors were completed in 2001, but they are out of operation until

the proposed Dora wastewater treatment plant is constructed. To date, no funding has been secured for the construction of this plant;

- The southern collectors comprise also two lines converging on Ghadir, where a preliminary wastewater treatment plant already exists. These two collectors are about nine kilometres long and will serve an estimated population of 784,000 people.

Wastewater collection systems are under preparation for major coastal cities including Tripoli, Jounieh, Saida and Tyre. Wastewater collectors are under execution in Akkar, Beddawi, Laboue and Baalbeck. (ibid. 2001)

Thirty-five wastewater treatment plants are currently planned or under construction (seven under construction, 18 under preparation and funded, 10 with no funding secured to date). The GOL initiated the construction of seven wastewater treatment plants in 2001: Saida, Chekka, Batroun, Jbeil, Chouf coastal area, Baalbeck and Nabatiyeh. The only large-scale treatment plant that is currently operational is the Ghadir plant, south of Beirut.

The Ghadir plant provides only preliminary treatment (i.e. grit and scum removal). A current study is exploring the economic feasibility of upgrading the Ghadir plant to provide secondary treatment before discharge into the sea.

Lack of funds represents a big problem that leads to the absence of operational wastewater treatment plants. Effluents from coastal agglomerations are discharged into the sea while effluents from inland communities are disposed in rivers and streams on open land or underground. While the number of sea outfalls has been surveyed, there is no information on the state of these outfalls (i.e. length, dimensions, loading volume, etc.).

Most outfalls extend only a couple of meters into the sea or terminate at the surface (no submersed outfall and therefore no effective dilution of wastewater). To note that the Ghadir outfall is a 1,200 mm diameter submersed pipeline which extends 2.6 Km into the Mediterranean Sea, the outlet point is approximately 60 meters deep thereby achieving some dilution of the disposed wastewater. (ibid. 2001)

Delays in wastewater works in several regions in the country have prompted several municipalities and local communities to make their own arrangements to improve wastewater collection and treatment.

In the next few years, Lebanon is going to face a new waste management problem: Sludge generated from wastewater treatment plants. The character and the amount of the solids depend on the number and type of industries within the community, the degree to which their wastes are pre-treated before discharge to the public sewers, and the primary and secondary processes employed within the treatment plant. A master plan for sludge management is being drafted. (ibid. 2001)

The preliminary report indicated that treatment plants will either generate digested sludge at the rate of 35-49 g/person/day, or undigested sludge at the rate of 63 g/person/day. The study examines available ways for reuse the sludge as a soil conditioner.

For example, digested sludge could be used in agriculture, provided the sludge meets minimum quality standards such as permissible heavy metal content, for the reason that sewage sludge contains micro-organisms that may contribute to the transmission of disease, as well as organic contaminants that may be hazardous or toxic to humans or have detrimental effects on the environment in general.

Table 4.4.a shows the estimated sewage sludge production for 2001 and 2010.

Table 4.4.a: Estimated Sewage Sludge Production for 2001 and 2010 (wet-weight basis)

Mohafaza	2001		2010	
	Mass (Tones/day)	Volume (m ³ /day)	Mass (Tones/day)	Volume (m ³ /day)
Beirut (Dora & Ghadir)	113	283,182	136	339,607
Rest of Mount Lebanon	21	162,981	26	198,150
North Lebanon	50	141,892	61	173,389
South Lebanon	14	66,811	18	83,329
Bekaa	53	297,472	69	465,552
Total	251	952,338	310	1,260,027

Source: ECODIT, 2001, p. 239.

4.4.2 Government Policies and Actions

A Damage Assessment Report was prepared to formulate a policy framework for the wastewater sector (in 1995). Implemented over three phases, the resulting National Emergency Response Program (NERP) launched two major programs:

- a. Coastal Pollution Control Program (CPCP): CPCP represents Lebanon's commitment to fulfil the requirements of the Barcelona Convention and its

protocols. Despite the cancellation in the late nineties of the World Bank loan to fund wastewater management works in Saida, Sour (Tyre) and Kesrouane, CPCP is proceeding with alternative funding from various sources.

b. Water Resources Protection Program (WRPP): Works under the WRPP include the rehabilitation of water treatment plants and water sources (springs and wells), as well as the rehabilitation and construction of transmission and distribution networks.

In 2001, the MoE took the lead in setting up a national follow up committee to look into and facilitate wastewater management works across the country. Hosted by the MoE, this committee is composed of representatives from CDR, the MoEW and the MoIM, and holds regular meetings to check on progress and bottlenecks.

1) National Emergency Rehabilitation Program (NERP): The NERP mainly concentrates on the rehabilitation of two wastewater-pumping stations in Al-Mina (Tripoli) and Jounieh, and the rehabilitation and construction of 820 Km of sewer networks in different areas of Lebanon (CDR, 2001). The construction and equipment of the first large-scale wastewater pre-treatment plant in Lebanon was completed in Ghadir, south of Beirut, as well as the rehabilitation of the associated sea outfall. This plant was brought into service in November 1997. NERP also implemented the installation and rehabilitation of sewer networks to serve the North Beirut area as well as the northern suburbs of the capital, up to the coastal agglomeration of Dbaye.

2) Government Contributions: CDR has awarded 122 contracts worth a total of US\$ 226.2 million in the wastewater sector, between January 1992 and December 2000:

- US\$ 120.5 million for construction of new networks and treatment plants in coastal areas;
- US\$ 62.5 million for operation and maintenance of sewer and drainage networks;
- US\$ 31.7 million for rehabilitation of existing sewerage networks;
- US\$ 11.5 million for water resource protection works.

As well as constructing an additional 26 solid waste and wastewater management facilities, using effective, affordable, and low-maintenance technologies well-adapted to rural areas, and which will enable 14,000 families to live in cleaner, healthier, safer surroundings. (ibid. 2001)

4.5 Conclusion

There are increasing problems facing the water sector in Lebanon, making it more difficult to handle them with the classical management approaches being followed. Both natural causes and human interferences are adding, cumulatively, to the extent of deterioration, quantitatively and qualitatively. There is a definite need to upgrade the water sector, and to secure its sustainability.

Lebanon is considered as “un Château d’Eau” compared to its neighbours but current water delivery systems do not meet the national demand for water. During fifteen years of civil war the water sector was barely operational and, as a result, the whole sector needs rehabilitation. These necessary innovations do require major institutional and administrative reforms as well as a new approach to water rights, water use efficiency and sustainability.

Imperfect knowledge prevails at all levels in the water sector and deeply entrenched beliefs, based upon past experience, hold and often block or even stop the process of policy innovation in national water sector. Furthermore, economically and environmentally sound water policies, often identified by foreign actors do not prove to be politically feasible. To most users water is considered a resource of which there is plenty, people therefore expect it to be free and not wish to pay for it. These conducts determine the political feasibility of introducing water policy reform that contains principles of allocation efficiency and production efficiency. Information gaps have to be filled and notions held by those working in the current order, must be identified in order to formulate an implementation strategy for Lebanon. Only then can reform be introduced effectively and without the delay that normally faces the reform in many countries in the region.

Lebanon’s water resources are partially developed, its water sector is in less than average shape, plus the lack of a sustainable management policy endangers the remaining freshwater resources. Political turmoil and chronic warfare are the reasons for the country slow water development until the early 1990s. Warfare rendered many reservoirs and pipeline non-functional, caused shortages of water in Beirut and led to the marginalisation of the country’s water sector and its associated local water authorities.

However, not all problems faced by the Lebanese water sector are related to civil war. If future projects are not carefully planned, and supervised, Lebanon will

face shortages (!!!). The hydrological metering network does not function properly, and other obstacles such as the poor distribution of precipitation in terms of time and place are challenging circumstances. The high proportion of Lebanon's water that flows into the Mediterranean Sea and the anarchic use of underground water (over exploitation and degradation) are considered as examples. The consequence of these problems is that information on water availability and demand in Lebanon is difficult to obtain and often less than reliable.

The shortage of up-to-date and reliable hydrological data makes it very difficult to plan adequate and sustainable management of the country's water resources into the 21st century. This data deficiency is critical, because economic development planning must consider the current hydrological picture to make sensible projections about growth and water needs. Reliance on 1930s data and 1950s infrastructure and instruments for gathering water data is an obstacle to the sustainable management of Lebanon's water resources.

The UN ESCWA predicts problems to come up in 2025, in case Lebanon continues its present rate of increase in consumption. This supposition made in 1998 is derived from the comparison of figures from 1997 and the projections for 2000 and 2025. Should irrigation for agricultural purposes be expanded, it will be most likely that within or after the next 24 years Lebanon will have to cope with a major water shortage problem (ECODIT. 2001).

It seems that the current efforts to avoid shortage have focused more on short-term strategies, as for example the improvement of water services through rehabilitation of the distribution system. For the coming years Lebanon's objectives are the increased utilization of surface water resources and development of groundwater recharge schemes.

Wastewater management in Lebanon is still in its very early phases. Plans are underway to expand the current wastewater treatment plant (Ghadir) and implementation started 2002. Many other treatments plants are under construction, some of which became operational in 2002. While sewage pollution load into the sea and rivers will decrease in the coming years, the operation of these plants will generate large quantities of sludge that will require adequate management to prevent environmental degradation.

As for the Arab world in general, Lebanon will have to face the following challenges:

- The lack of public awareness of rational use and management of water;
- The lack of institutional coordination, relevant legislation and implementation, and inadequate financial resources;
- The lack of up-to-date knowledge of sources in quantity and quality;
- The absence of cooperation at the regional or sub-regional level in shared rivers.

Part III *Freshwater Resources from the Perspective of International Law, Economics and Religious-Culture*

5 International Law, Economic and Religious-Culture Perspectives

5.1 Introduction

The ability for nations to resolve conflicts peacefully over internationally distributed water resources will increasingly be a factor in stable and secure international relations. As water resources become relatively scarcer, their use within nations can no longer be insulated from impacting on one's neighbours.

Section 5.2 tackles the gains to cooperation by using economic models, and which the relationship between externalities, property rights and economic efficiency models (efficiency in exchange, and efficient allocations). This chapter then shows the role of strategic behaviour and bargaining strategy, and talks about the potential gains to cooperation and international agreements, as well as discussing the Coase Theorem and its presence in an international context.

This chapter considers, in section 5.3, the present state of water under international law, current problems and weaknesses in existing law, and outlines principles of customary law and the existing international conventions and the relevant protocols in this area. It focuses on the relationship between water and conflicts, and tries to answer the question of adequacy of protection and weakness in existing law.

The concept of war is changing, and the term is used more often today in the international war against terrorism. This chapter discusses the relationship between water and conflicts, terrorism and the threat against water facilities.

Finally, this chapter ends by explaining the role of religion in this matter; the Islamic point of view, which is based on *Shari'a*, the Vatican's position, and the Jewish perspective.

5.2 Gains to Co-operation using Economic Models

The allocation of water resources according to its economic value is considered as one of the most important principles involved in water conflict resolution theory. Here we distinguish between:

- The allocation of water to its highest value use; “efficiency”;
- And the distribution of gains from allocation; “equity”.

Negotiated outcomes need not maximize net benefits for all countries. Inefficiencies can be traced to the desire to nationalize resources rather than to gain from cooperative development.

Both efficiency and equity could be considered in agreement for managing international water resources. For example the 1959 Nile Waters Agreement between Egypt and Sudan did not reserve water for upstream riparian (Ethiopians). A basin wide agreement could make use of the Nile water more efficiently for the benefit of all three riparian: Egypt, Sudan, and Ethiopia. Construction of dams in Ethiopia would give that country irrigation, eliminate the annual Nile flood, and increase the total water available to Ethiopia and Sudan.

In negotiations over use of the Nile, the net benefits of basin wide management, and the ways these three riparians could share equitable gains, should be demonstrated.

Different users and uses of given water supplies, may place different values on the resource. Therefore, water sharing should take into consideration the possibility of increasing the overall efficiency of water utilization by re-allocating the water according to these values.

This principle alone may not be accepted as equitable or fair by the parties involved. However, inclusion of economic aspects in water resource allocation may enhance better cooperation and future collaboration in joint projects in the region of concern.

The basic economic problem that underlies all economic issues is the combined existence of scarce resources and unlimited wants. Given that, the first question is how to use scarce resources and organise production so as to satisfy, to the greatest extent possible, society’s unlimited wants.

In other words, the available resources must be used as efficiently as possible, meaning that the maximum output must be obtained from the resources at hand (see appendix 1, annex 7 for more details).

5.2.1 Role of Strategic Behaviour, and Bargaining Strategy

Usually the focus is on political issues when negotiations take place between two countries. Underlying the political issues (national sovereignty, creative diplomacy ... etc) lie many economic factors (observed benefits and costs), that affect positively all the different participants and give the incentives for entering into environmental agreements.

The negotiations between polluters and those damaged can result in efficient emission level, given that property rights are clearly defined and the transactions costs are minimal (see appendix 1, annex 7 for more details). On the international level, the globally efficient level of emissions should be attained through direct negotiations.

Because International agreements are voluntary, it may be supposed that individual countries will never sign any agreement that makes them worse off. Accordingly, both parties seek an agreement that leaves them at least as well off as they would be without it. Furthermore, in the absence of any cooperation, each country will maximize its own net benefits of abatement and in doing so will choose a level of abatement at which its own marginal abatement cost equals its own marginal abatement benefit (see appendix 1, annex 7 for more details).

Bargaining depends critically on the perceptions by each country of its own marginal damages and marginal abatement costs, as well as on how convincing it can be in expressing these views to other countries. Countries engaged in negotiations of this type will usually be involved at the same time in negotiations on other problems, as well as with negotiations with other countries. Thus, they will be concerned with the net outcome of all these negotiations, and this could dictate a position on this one issue quite different from what one would expect solely on the basis of the merits of this particular case.

5.2.2 The Potential Gains to Cooperation and International Agreements

The economic game theory suggests they can either be cooperative or non-cooperative. A game is cooperative if the players can negotiate binding contracts that allow them to plan joint strategies. A game is non-cooperative if negotiation and enforcement of a binding contract are not possible.

To solve cooperatively the problem of water allocations within a basin, the parties involved should realize some mutual benefits that can be achieved only through cooperation and be allocated to the parties. In cases of cooperation, each

party needs to participate voluntarily, and to accept the joint outcome from the cooperative project. Once a cooperative interest exists, the only problem, which remains to be solved, is the allocation of the associated joint costs or benefits.

For a cooperative solution to be accepted by the parties involved, it is required: (see appendix 1, annex 7 for more details)

- The joint cost or benefit is partitioned such that each participant is better off compared to a non-cooperative outcome;
- The partitioned cost or benefit to participants is preferred in the cooperative solution compared to sub-coalitions that include part of the potential participants;
- The costs or benefits are allocated.

In the absence of a negotiated settlement, the country causing the externality will ignore the damages its activities impose on other countries. The full cooperative outcome is achievable by internalising the externality. In this case the country inflicting the externality chooses its actions so as to maximise the net profits of all countries, including it-self.

Global net benefits will be higher in this case. The difference between the global net benefits to the cooperative and non-cooperative outcomes defines the potential gains to cooperation.

In any economic game (or any game in general) the most important aspect of strategy design is understanding your opponent's point of view, and deducing how your opponent is likely to respond to your actions. Yet even in simple gaming situations, people often ignore or misjudge their opponents' positions and the rational responses those positions imply.

Table 5.2.a shows two countries, A and B. Both share a common aquifer, and both face two choices: extract the water at a High or Low rate. This can be considered as an example of the Prisoners' dilemma game; the assumption here is that the numbers on the left are A's payoff and the numbers on the right are B's payoff (Table 5.2.a).

Each country prefers higher payoff to a lower payoff, but does not care what payoff the other country receives. Despite that, the two countries are interdependent insofar as each country's realized payoff depends not only on its own choice for a rate of extraction but also on the choice made by the other country.

Table 5.2.a Prisoners' Dilemma Game

	<i>B</i>	<i>Low</i>	<i>High</i>
<i>A</i>			
<i>Low</i>		5 - 5	2 - 6
<i>High</i>		6 - 2	3 - 3

Due to the existence of interdependency, what strategy should the players pursue? - In deciding whether to choose "High" or "Low", country A will wish to consider how the payoffs it receives depend on player's B strategy. Suppose B chooses "Low" then A receives a payoff of 5 if it chooses "Low" and 6 if it chooses "High". So given B's choice (Low), A's best response is to choose "High". Suppose now that B chooses "High", then A receives 2 if it chooses "Low" and 3 if it chooses "High".

Again, given that B chooses "High", A's best choice is "High". This means that A should choose "High" whatever B chooses. Choosing "High" is therefore a dominant strategy. Since the game is symmetric, choosing "High" is also a dominant strategy for B. Thus, the equilibrium (Nash) to this game for both players is to choose "High" and to receive a payoff of 3 each. The equilibrium to the game is inefficient (as choosing Low leads to a higher payoff for both parties).

Note that in this game both players have strictly dominant strategies. This need not be true for other payoffs. A player has a strictly dominant strategy if this strategy outperforms other strategies regardless of what opposing players do. When a player has a strictly dominant strategy this is the player's Nash equilibrium strategy.

In many games players do not possess strictly dominant strategies. It is advisable however to check whether such dominant strategies do exist since then Nash equilibrium is immediately determined. Searching for strictly dominant strategies is a basic practical 'first-shot' attempt at trying to solve a game.

It is interesting to note that the Nash equilibrium does not maximize the aggregate payoff to both players. Total profits are maximized when both parties choose Low. It would thus be better for them to get together and reach a cooperative agreement. That pursuing individual self-interest yields a Nash equilibrium outcome yielding lower payoffs to both players than the cooperative

outcome is an instance of the Prisoners' dilemma. Note that this Prisoners' dilemma has three characteristics:

- Each player has an option to cooperate or defect;
- Each player has a dominant strategy (to defect);
- The dominant strategy equilibrium is inferior for each party to the non-equilibrium solution to cooperate.

These features characterise all Prisoners' dilemma situations.

If both parties negotiate an agreement, which specifies (by assumption) that if either party chooses "High", it would have to pay a fine to the other party equal to 2.

Table 5.2.b shows that if B chooses "Low" and A does not, A receives payoff of 4 (6 in the original game but now must pay a fine equal to 2). Hence, B receives payoff of 4 (originally 2 plus the fine). The payoffs are the same if A chooses "Low" and B chooses "High". Accordingly, the best strategy for each player is to choose "Low", whatever the other player chooses. Thus, the agreement makes choosing "Low" a dominant strategy and the equilibrium to the altered game is efficient.

Table 5.2.b Prisoners' Dilemma Game include Penalties for "Cheating"

	<i>B</i>	<i>Low</i>	<i>High</i>
<i>A</i>			
<i>Low</i>		<i>5 - 5</i>	<i>4 - 4</i>
<i>High</i>		<i>4 - 4</i>	<i>3 - 3</i>

There is no guaranty that the allocation of water resources is efficient when there is international interdependence. The nature of interdependence that exists among countries can be complex. Many shared water problems are unidirectional, as in the case of upstream countries causing harm to downstream countries. The fact that countries are interdependent means that they can potentially be made better off if they can cooperate in managing international water resources and in practice such cooperation is typically codified in international agreements.

Attempts to correct unidirectional externalities encounter difficulties. Consider the problem where certain activities by one country harm all others. If the rights to generate externalities are vested in one country, the others will have to pay this

nation to cease its destructive activities. If the externality affected only one other country, then bargaining might be possible; the externalities might be internalised without outside intervention.

But in the case of global or regional externalities, all countries except the generator suffer. All sufferers might be willing to bribe the generator to cease its harmful activities. But a contribution by any one country would confer benefits on all others and not just the one making the compensation payments. The others could therefore do better by free riding. Accordingly cooperation would be foiled.

Mechanisms exist that can lead countries to reveal their preferences for global public goods truthfully, and hence for correcting global externalities. But in the absence of a World Government these mechanisms cannot be employed without the consent of the sovereign nations themselves. The problem of correcting global externalities, such as of managing global common property, is that global optimality demands global cooperation, and yet the incentives facing individual countries work in the opposite direction. Based on that, assumption that cooperation will not develop is compelling, but they can hardly be complete. Cooperation does take place and is often codified in international agreements.

In an international dispute, agreements between countries cannot be enforced by a third party. International agreements must be self-imposed; this may mean that international water resources potentially cannot be managed as efficiently as international resources.

The difficulty of implementing an efficient international agreement is that there is no supranational organization to enforce such agreement, thus the agreement must appeal to each nation individually. In fact there are three desirable characteristic of a global agreement:

- The agreement should be self-enforcing;
- Each country should be better-off participating in the agreement;
- Environmental conditions provided by the agreement should be Pareto-preferred to the status quo and, ideally, Pareto efficient.

It is easy to meet two of these three conditions leaving the other condition unfulfilled.

The fact that these agreements exist does not mean that they achieve the full cooperation outcome, where the actions (water extraction rates, pollution emission levels ...etc) of parties are chosen to maximise the net benefits of all affected

countries taken together. Many agreements are incomplete in the sense that the number of parties is less than the number of countries affected. International negotiations on environmental treaties are only one dimension of the full set of international interactions among countries. How an individual country behaves in bargaining over, for example, a treaty reducing environmental damages depends not only on the merits of that particular problem but on the whole gamut of international relationships in which it is involved. If it is involved simultaneously in negotiations on other matters, it may be more concerned with the total outcome and be willing to compromise in some areas in return for concessions in others.

In addition, when countries are involved in negotiations they may be concerned particularly with supporting up their reputations as hard bargainers, which may lead them to behave, in certain cases, in ways that look to be inconsistent with their self-interest.

Developing a reputation can give one a strategic advantage, and developing the right kind of reputation can be viewed as a strategic move.

In many cases, the disagreement point of negotiations will not be decided by legal doctrines alone but by the threats that countries can make regarding the actions they would choose in the event that negotiations break down. In some cases, this disagreement point will be given by the non-cooperative outcome. In general, a country will do better in negotiations if it can commit itself to a particular action in the event of a breakdown in negotiations.

Such strategic behaviour can enhance the country's strength at the negotiating table.

5.2.3 The Coase Theorem and its application in an International Context

According to the Coase Theorem, the bargaining solution will be efficient when property rights are clearly specified, when transactions costs are close even equal to zero, and when there is no strategic behaviour (noting that bargaining is unlikely to generate an efficient outcome because parties frequently behave strategically).

The Coase Theorem suggests that war should be unlikely, rather than fighting the two sides could achieve some mutually advantageous bargain. They could live at peace with a higher standard of living or in case of conflict one side (the weaker) should surrender rather than fight.

On the international level, the globally efficient level of emissions should be attained through direct negotiations, given that property rights are clearly defined and the transactions costs are minimal.

Furthermore, the law of international water resources offers two extreme rules relating to property rights; the doctrine of “unlimited territorial sovereignty”, which states that a country has exclusive rights to use of water within its territory (this view sometimes called the “Harmon Doctrine”). And the doctrine of “unlimited territorial integrity”, which states that the quantity and quality of water available to a country, cannot be altered by another country.

If the doctrine of “unlimited territorial sovereignty,” is accepted by both parties and if each party seeks to maximise its own payoff, then the upstream country will abate its emissions up to the point where the marginal cost of abatement equals the marginal benefit of abatement to itself. (Barrett, S. 1994)

In an extreme example, where the upstream country does not benefit at all from abatement, and no abatement will be undertaken in the absence of bargaining, even if the downstream country would benefit substantially from upstream abatement.

Under the doctrine of “unlimited territorial integrity”, the pre-bargaining position is very different. The upstream country cannot emit any pollution into the river, even if the downstream country would not suffer any damage from pollution. Whichever doctrine is accepted the pre-bargaining outcome is likely to be inefficient. Both countries could potentially be made better off through bargaining.

One might expect that two such different doctrines would result in two different post-bargaining outcomes. Coase Theorem shows that this is not the case if:

- Parties doing bargaining know more about the relative values involved (abatement costs and damages);
 - There are no transaction costs;
 - The pollution issue of the river can be seen in isolation from other international relations;
 - Sometimes difficulties of achieving mutually beneficial bargaining outcomes can be resolved by giving a party, harmed by another party, the right to sue.
- Thus eliminating the need for bargaining because it specifies the consequences of the choices each of the parties must make.

Bargaining can be time-consuming and costly, especially when property rights are not clearly specified. Neither party is sure how hard to bargain before the other party will agree to a settlement. Bargaining can also break down even when communication and monitoring are costless; if both parties believe they can and should obtain larger gains.

One party when making a demand for larger share and refuse to bargain assumes incorrectly that the other party will eventually concede. This strategic behaviour can lead to an inefficient, non cooperative outcome. In this situation, an agreement may never be reached, especially if one or both parties want to earn a reputation for tough bargaining.

In an international context there are a number of problems with the Coase theorem. A third party, which can impose either doctrine on the two countries does not exist. Agreements between parties must be self-enforcing. The doctrine, which is most attractive to one country, is least attractive to the other.

If a country accepts a doctrine in one instance, then the precedent may be held against it in another. Hence, it may not be in the self-interest of either party to endorse unreservedly one of the doctrines.

The problem is that neither of these two doctrines is likely to be acceptable to both parties. Suppose country (A) invokes the doctrine of “unlimited territorial sovereignty” in negotiations, then (B) might well threaten to reconsider its position on trade or defence agreements. If (B) invokes the doctrine of “unlimited territorial integrity” then (A), might well threaten to pollute the river anyway.

Suppose two parties are moving toward some kind of peace agreement, each side offers some painful concessions to the other. At this specified moment some form of terrorism strikes. This kind of behaviour makes it harder for each side to accept other’s offer. Terrorists, knowing this, may choose to strike at precisely at these times and aim to reopen the appropriate “wounds”, all to prevent peace.

5.3 Water under International Law

International law constitutes the rule and norms by which states conduct their actions in relation to other states. In the context of international water resources, the law (international water law) endeavours to define riparian states’ rights and obligations to their shared waters.

Historically, the focus of international water law was on surface waters such as shared lakes and rivers. The use, management and conservation of shared groundwater resources received little attention in international legal discourse and political circles, and generally were absent from bilateral and multilateral agreements.

International water law did not begin to be formulated until after World War I. Advisory bodies and private organizations have tried to provide a framework for increasingly intensive water use, focusing on general guidelines, which could be applied to the world's watersheds. These general principles of customary law were not intended to be legally binding.

The uniqueness of each basin and its riparian states suggest that any universal set of principles must be fairly general. The problems arise when attempts are made to apply this reasonable but vague language to specific water conflicts. For example, riparian positions and consequent legal rights shift with changing boundaries many of which the world community still does not recognize.

Furthermore, international law only concerns itself with the rights and responsibilities of states. Some political entities that may claim water rights, would not be represented, such as the Palestinians along the Jordan River, even though, the Palestinians do have some degree of autonomy and even sovereignty within their territory.

5.3.1 Inadequacy of international law

International law has evolved in response to the changing character of international conflict. Most conventions and treaties were designed to cover conflicts of an international character. The concept of war is changing, and the term is used more often today in the international war against terrorism.

As international water law is ambiguous and often contradictory, and no mechanism exists to enforce principles, which are agreed-upon, criteria for equity are particularly difficult to determine in water conflicts.

1) General principles of international law

The framework of international law derived and applied by the International Court is revealed in Article 38 of the Statute of the International Court of Justice (ICJ):

“The Court, whose function is to decide in accordance with international law such disputes are submitted to it, shall apply:

- International conventions, whether general or particular, establishing rules expressly recognised by contesting states;
 - International custom, as evidence of a general practice accepted as law;
 - The general principles of law recognised by civilised nations;
 - Judicial decisions and the teachings of the most highly qualified publicists of the various nations, as subsidiary means for determination of rules of law.”
- (UNEP – ELI/PAC. 1998)

It is important to mention that conventions (often referred to as treaties) represent the best grounds of the will of states, and are considered the primary source of international law. It is true that while conventions are binding only on the signatories, they may become customary international law, thereby becoming binding on non-signatories, in other words if those conventions receive consistent and widespread acceptance, customary law may assist in clarifying treaty provisions, when the terms of the treaty are subject to interpretation. 1907 Hague Convention on Land Warfare is well-known example. (Vinogradov, Wouters and Jones. 2004)

International custom is the secondary source of international law and is applicable to all nations. When applicable conventions and customary international law do not exist, general principles of law recognised by civilized nations are traditionally used to fill the gaps. However, these principles may need interpretation and translation.

For example in the 1997 discussions among the riparians of the Euphrates basin, Syrians objected strongly to the proposals for water pricing. This led to a temporary impasse until it was explained by an outside observer that some Islamic legal interpretation forbids charging money for water itself. When the term was modified to mean “tariff”, representing costs only for storage, treatment, and delivery, and discussions were able to proceed. (ibid. 2004)

Similarly, Israelis and Jordanians invented legal terminology to suit particularly local requirements in their 1994 peace treaty. In negotiations leading up to the treaty, the Israelis, arguing that the entire region was running out of water, insisted on discussing only water allocations; that is, the future needs of each riparian. The Jordanians, in contrast, refused to discuss the future until past grievances had been addressed; they would not negotiate allocations until the historic question of water rights had been resolved. There is little room to bargain between the past and the future, between rights and allocations.

Negotiations reached an impasse until one of the mediators suggested the term 'rightful allocations' to describe simultaneously historic claims and future goals for cooperative projects, this new term is now imbibed in the water-related clauses of the Israel-Jordan Treaty of Peace. (ibid. 2004)

2) Customary International Law

Martens Clause of the 1907 Hague Convention attained the status of customary international law through the international community's widespread observance: *"Until a more complete code of the laws of war has been issued ... the inhabitants and belligerents remain under the protection and the rule of the principles of the law of nations, as they result from the usages established among civilized peoples, from the laws of humanity, and the dictates of the public conscience"*. (Lorenz. 2003, p. 11)

Customary international law has focused on providing general guidelines for the watersheds of the world. Many of the common claims for water rights are based either on hydrography i.e. from where a river or aquifer originates and how much of that territory falls within a certain state. Or on chronology i.e. who has been using the water the longest time.

Most of the debate in the realm of customary law has been over trying to accommodate as many concerns as possible in an attempt to find generalized principles for all of the world's international watersheds, in the meantime riparians of these basins have been negotiating agreements which focus on specifically local concerns and conditions.

Even as the principles for sharing scarce water resources evolve and become more moderate over time, the essential argument still emphasizes the rights of each State (a riparian is entitled to a certain quantity or use of water depending on certain physical or historical constructs), generally resting on the fundamental dispute between hydrography and chronology.

3) International Conventions:

General and particular rules developed in The Hague and Geneva Conventions, which are under international humanitarian law, protect water facilities that supply water to human populations.

The Hague Conventions are concerned with rules related to the methods and means of warfare, while the Geneva Conventions are concerned with the victims of

war. Given this, water facilities are not mentioned by name, and the conventions apply only during time of war or other conflict.

The Hague Law: In 1868, the Declaration of St. Petersburg was announced at a meeting called Tsar Nicholas II of Russia. This was the first action to the continuing concern over the increasingly destructive warfare of the era. The declaration was short and simple:

“The only legitimate object which States should endeavour to accomplish during war is to weaken the military forces of the enemy”. (ibid. 2003, p. 8)

This declaration “established” the foundation for the modern international humanitarian law and its evolution.

The 1899 and 1907 Hague Conventions, initiated by Tsar Nicholas in an attempt to “humanize” war, furthered the cause of limiting armaments by providing that “the right to adopt means of injuring the enemy is not unlimited” (Lorenz. 2003). Additionally, Article 23(g) of the 1907 Convention states that it is forbidden to “destroy or seize the enemy’s property, unless ... imperatively demanded by the necessities of war” (ibid. 2003). While this does not mention water or water facilities, they may be protected under this provision as well as other related to property.

The Annex to the Hague Convention IV, Article 1, sets out the basic qualification of war-like behaviours, those individuals and groups that are subject to the “laws, rights and duties of war”. It applies to armies, militias and volunteer corps fulfilling the following conditions:

- To be commanded by a person responsible for his subordinates;
- To have a fixed distinctive emblem recognizable at a distance;
- To carry arms openly;
- And to conduct their operations openly and in accordance with the laws and customs of war.

This forms a basic principle of international humanitarian law today, although some expansion was attempted later with Protocol II to the Geneva Convention. Together with the requirement for an “armed conflict”, the scope and application of international humanitarian law has been developed.

The “Geneva Law”: The first in a series of Geneva Conventions was in 1864; it addressed the treatment of the sick and wounded soldiers in time of war. Broader issues of humanitarian law were the focal points in 1868, 1906, 1925 and 1929 Geneva Conventions. In response to the failure of the Hague agreements in the First

World War and the atrocities committed in the Second World War, four additional Protocols were signed in 1949 by sixty-four states to provide more specific provisions to protect victims of war.

These four Protocols were accepted by the international community more than any other agreements, concerning international humanitarian law, and they also contained the beginnings of modern concepts of environmental protection during wartime. (ibid. 2003, p. 8-9)

In addition to the prohibition against “wilfully causing great suffering or serious injury to body or health”, the conventions prohibit the “extensive destruction and appropriation of property not justified by military necessity and carried out unlawfully and wantonly”; water storage and water facilities can be considered as examples.

4) *The 1977 Protocols to the Geneva Conventions* (ibid. 2003, p. 9, 10, 11)

The prohibition of military or any other hostile use of Environmental Modification Techniques (ENMOD) and Protocol I and II to the Geneva Convention of 1949 were opened for signature in 1977.

The purpose of Protocol I and ENMOD was to address the widespread awareness of the environmental destructiveness of the Vietnam War. Previously there was not much attention from the international community to the environment, especially in the four Geneva Conventions following the Second World War. Media coverage during the Vietnam’s war, plus an increasing worldwide awareness of the environment, led to the adoption of Protocol I, and ENMOD. Despite growing international concern about the effect of war on the environment, neither of these agreements has been universally adopted.

Protocol I: The protection of the environment during periods of armed conflicts is specifically addressed in Articles 35 and 55 of Protocol I.

Article 35 begins by restating two principles developed in St. Petersburg and The Hague; the right to choose means of warfare “is not unlimited” and it is prohibited to employ “methods of warfare of a nature to cause superfluous injury or unnecessary suffering”. Article 35 (3) further strengthens the protection of the environment by stating that “it is prohibited to employ methods of warfare which are intended, or may be expected, to cause widespread, long-term and severe damage to the natural environment”. Article 35 (1) mentions the protection of the environment as a basic rule.

Article 55 represents the “only truly environmental” provision in Protocol I. It states:

1. Care shall be taken in warfare to protect the natural environment against widespread, long-term and severe damage. This protection includes a prohibition of the use of methods or means of warfare, which are intended or may be expected to cause such damage to the natural environment and thereby prejudice the health or survival of the population.
2. Attacks against the natural environment by way of reprisals are prohibited.

While neither of these provisions mentions water directly, it is nearly clear that protection of water storage and water facilities fall under these rules as well as all rules that have been established to protect the environment.

ENMOD: In response to the “severe” environmental damage during the Vietnam’s war as a result of the United States use of chemicals and defoliants, the Environmental Modification Techniques (ENMOD) was established. The intention was to prohibit the military use of climate modification techniques, which can cause “widespread, long-lasting, or severe” damage to the enemy and obviously to the environment including water storage and water facilities:

- Widespread: encompassing an area on the scale of several hundred square kilometres;
- Long lasting: lasting for a period of months, or approximately a season;
- Severe: involving serious or significant disruption or harm to human life, natural and economic resources, or other assets.

Article 2 of the ENMOD attempts to explain and to define the phrase “environmental modification techniques”; it is any technique that modifies “the dynamics, composition or structure of the Earth, including its biota, lithosphere, hydrosphere and atmosphere, or of outer space” (Lorenz. 2003). By using the word hydrosphere ENMOD provides some degree of protection for water and the facilities that contain or transport it. To note also that the use of term “military or any other hostile use” instead of “armed conflict” or “war” was to further suggest the broadened application of the Convention.

By providing an upper limit on the acceptable level of environmental damage, ENMOD refines the balancing of this damage with military necessity. Only recently the modern science is beginning to understand the relationship between water supply and climate change. In spite of the lack of universal adoption of ENMOD,

state recognition of the need to limit the level of environmental damage during times of military or other hostile activities, which could directly or indirectly affect the Earth's water resources, could have significant importance for the protection of water facilities and water supply in general.

Protocol II: Protocol II intends to provide basic protection for the victims of non-international armed conflicts. It calls for states to recognize that “in cases not covered by the law in force, human person remains under the protection of the principles of humanity and the dictates of the public conscience”. It does not apply to “internal disturbances and tensions”, which are “isolated and sporadic acts of violence”.

It is important to note that both Protocols I and II have not been universally adopted. (ibid. 2003, p. 11)

5) The 1997 UN International Watercourses Convention (Vinogradov, Wouters and Jones. 2004, p. 17-24)

The initial attempt to draft a treaty of universal application to international freshwaters dates back to 1970, when the UN General Assembly asked its International Law Commission (ILC) to prepare a set of rules governing the non-navigational uses of International Water Courses (IWC). The Commission, which consists of thirty-four international lawyers serving in their individual capacity and representing the major legal systems of the world, is a special UN organ entrusted with the codification and progressive development of international law.

In 1994, the ILC adopted Draft Articles on the law of the non-navigational uses of international watercourses, following close to thirty years of work on the topic. This project went forward to the UN General Assembly and its Sixth (Legal) Committee, which provide the forum for negotiating and adopting the 1997 IWC Convention. It is important to mention that given the multiple and the variety of international agreements dealing with water resources, there is only one universal treaty in this area; the 1997 UN Convention on the Non-Navigational Uses of International Watercourses (1997 IWC Convention).

It took the ILC 21 years to complete its “Draft Articles”, despite an additional call for codification at the UN Water Conference at Mar de Plata in 1977. For example, it took until 1984 for the term “International Watercourse” to be adequately defined. In 1994 the ILC adopted a set of 32 draft articles. The UN General Assembly adopted the articles, with some amendments, as the Convention on the

law of the Non-Navigation Uses of International Watercourses on May 21, 1997. The vote was 104 in favour, 3 against (Turkey, China and Burundi), and 27 abstentions. (ibid. 2004, p. 18)

The concept of a “drainage basin”, for example, was accepted by the International Law Association (ILA) in the Helsinki Rules of 1966, which also provides guidelines for “reasonable and equitable” sharing of a common waterway. Article 5 (see appendix1, annex 1) lists no fewer than eleven factors which must be taken into account in defining what is “reasonable and equitable”. There is no hierarchy to these components of “reasonable use”, rather they are to be considered as a whole. Some states objected to the prominence of the “drainage basin” approach, which might be interpreted as an infringement on a nation’s sovereignty. Others argued that a watershed was the most “rational and scientific” unit to be managed. Given the complexities and uniqueness of each watershed, general codification should not even be attempted others indicated. (ibid. 2004)

The 1997 Convention includes provisions for concepts, “reasonable and equitable use” and the obligation not to cause “significant harm” without setting a clear priority between the two.

One important shift in legal thinking in the Helsinki Rules is that they address the right to “beneficial use” of water, rather than to water by itself. The Helsinki Rules have been used only once to help define water use, the Mekong Committee has used the Helsinki Rules definition of “reasonable and equitable use” in formulation of their Declaration of Principles in 1975, although no specific allocations were determined.

The document about Groundwater includes eight factors for consideration in allocations, and suggests that “the weight to be given to each factor is to be determined by its importance in comparison with that of the other relevant factors”. (ibid. 2004)

Much of the discussions leading to the Convention centred on how “reasonable and equitable use” within each watercourse state, “with a view to attaining optimal utilization thereof and benefits there from”, is balanced with an obligation not to cause significant harm. Reasonable and equitable use is defined similar to the Helsinki Rules, to be based on a non-exhaustive list of seven relevant factors.

The text of the ILC articles does not offer guidelines for prioritising these factors, suggesting in Article 6 (see appendix 1, annex 1) only that “the weight to be given to each factor is to be determined by its importance”, and that “all relevant factors are to be considered together”.

Article 10 (see appendix 1, annex 1) says both that, “in the absence of agreement or custom to the contrary, no use...enjoys inherent priority over other uses”, and that, “in the event of a conflict between users (It shall be resolved) with special regard being given to the requirements of vital human needs”.

The debate over which doctrine, “reasonable use” or “no harm” shall have priority has been intense, and was one of the focuses of discussion leading to the Convention. The World Bank, which must follow prevailing principles of international law in its funded projects, recognizes the importance of equitable use in theory but, for practical considerations, gives “no appreciable harm” precedent and will not finance a project which causes harm without the approval of all affected riparian. (ibid. 2004)

Despite significant controversy over whether or not it was appropriate for a framework convention to contain dispute settlement provisions; Article 33 offers a range of dispute resolution mechanisms. States are free to select the means through which to settle their differences, including negotiation, mediation, conciliation, joint watercourse institutions, and so forth. If these attempts fail, any state to the dispute can unilaterally invoke the compulsory fact-finding procedure provided for under Article 33. (Appendix 1, annex 1)

6) Other International Rules and Statements on International Water Resources

The Berlin Rules

On the 21st of August 2004 at Berlin Congress, the International Law Association produced a series of rules relating to the overall field of international water law.

Berlin rules are the result of revision of the Helsinki and other International Law Association rules on international water resources.

Professor Joseph W. Dellapenna (Rapporteur of the Water Resources Committee, drafted these rules with help of several members of Committee) noted that “First ... these *Rules* both express rules of law as they presently stands and, to a small extent, rules not yet binding legal obligations but which, in the judgment of

the Association, are emerging as rules of customary international law. In other words, some of these *Rules* express the progressive development of the relevant international law. Following the recent practice of International Law Commission and reflecting the conclusion of the Committee that such progressively developed *Rules* will become settled customary international law in the near future, all *Rules* are expressed as present legal obligations (“shall”), leaving identification of *Rules* as progressive developments to the commentary. Second, most of the *Rules* contained herein are applicable to all waters—meaning all surface waters and groundwater other than marine waters—regardless of whether the waters in question are found in an international drainage basin». (Dellapenna. 2004)

The major changes in the *Berlin Rules* relate to the rules of customary international law applicable to all waters—national as well as international. Chapter II sets forth the general principles applicable to all waters: the right of public participation, the obligation to use best efforts to achieve both conjunctive and integrated management of waters, and duties to achieve sustainability and the minimization of environmental harm.

Many of the remaining chapters develop these basic principles in significant detail. Much or most of the materials in these chapters either is new or is significantly different from the content of either the *Helsinki Rules* or the *UN Convention*, both of which restricted their coverage only to international waters. Chapter III and some other chapters address the special rules of law applicable to transboundary waters. Chapter VIII provides the first comprehensive analysis of the customary international law applicable to groundwater. This chapter goes beyond the International Law Commission’s subsequently proposed *Draft Articles on Transboundary Aquifers*, both in addressing the customary international law applicable to national as well as international groundwater and in taking a more progressive stance on certain issues.

Finally, the *Berlin Rules* address humanitarian law relating to water resources during armed conflict, navigation, and dispute resolution, all issues that the *UN Convention* and the *Draft Articles* either ignore or barely mention. (Ibid. 2004)

The Dublin Statement

On 26-31 January 1992, five hundred participants, including government-designated experts from a hundred countries and representatives of eighty international, intergovernmental and non-governmental organizations attended the International Conference on Water and the Environment (ICWE) in Dublin, Ireland.

The experts saw the emerging global water resources picture as critical. At its closing session, the Conference adopted this Dublin Statement and the Conference Report.

The Conference participants call for fundamental new approaches to the assessment, development and management of freshwater resources, which can only be brought about through political commitment and involvement from the highest levels of government to the smallest communities. Commitment will need to be backed by substantial and immediate investments, public awareness campaigns, legislative and institutional changes, technology development, and capacity building programs. Underlying all these must be a greater recognition of the interdependence of all peoples, and of their place in the natural world.

In commending this Dublin Statement to the world leaders assembled at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in June 1992, the Conference participants urge all governments to study carefully the specific activities and means of implementation recommended in the Conference Report, and to translate those recommendations into urgent action programs for Water and Sustainable Development. (See appendix 1, annex 10)

5.3.2 Relationship between water and conflicts

Water resources become relatively scarcer and their use within nations can no longer be insulated from impacting on one's neighbours. More conscious attention to the art and science of negotiation, mediation and arbitration can provide useful insights for resolving these conflicts without recourse to the limited solutions possible in international courts of law or, worse, the devastating possibility of armed conflict.

Disputes over international waters are both common and current. The most recent example includes the increasing tension over shared water resources between Israel and Lebanon, the dispute over Chebaa Farms, Kfarshouba Hills. Also Israel opposes strongly Lebanon's pumping of additional water from the Hasbani River, which is a tributary to the Jordan River, to its border villages, for drinking purpose.

In this regards, it is important to mention the 2003 water allocation dispute between Lebanon and Israel over the distribution of the Wazzani River. The Wazzani springs rise in Lebanon close to the Blue Line, their waters feed the Hasbani River. In October 2002 as part of a concerted international response to rising tensions

between Israel and Lebanon over the construction of a pumping station at the Wazzani springs, the European Commission sent an expert team under the Rapid Reaction Mechanism to Lebanon and Israel. The team was sent in response to an appeal by the Lebanon and the UN for assistance in resolving the dispute. It was tasked with providing an objective assessment of the technical data upon which a mediated settlement of the dispute could be built. The study team delivered its report in July 2003, but in the absence of an agreed framework for mediation of the dispute the report has not yet been released, though Israel, Lebanon, the US and the UN have been briefed on its key findings. (For more details see Appendix 1, Annex 9)

The question of transboundary water resources and water scarcity in river basins is an area of great and increasing concern to the international community. The past fifteen years have seen a renewed interest in the relationship between the environment, resource scarcity, and violent conflict. Some experts predict that by the year 2025, chronic water scarcity will affect as many as three billion people in fifty-two countries (ibid. 2004).

The relationship between water scarcity and conflict is complex, it represents by most scholars one of factors that can contribute to conflict, and there has not been a documented case of a “water war” in modern history. The changing nature of conflict and shortage of fresh water will certainly increase the potential for instability in the years ahead.

The “Law of War”, or “Law of Armed Conflict”, is a branch of public international law that governs the conduct of nations during times of armed conflict. The purpose of the law of war is not to protect water or water facilities, but rather the human population dependent upon them for its survival. While the law of war is designed primarily to limit destructive action affecting the environment, recent amendments have been adopted that specifically address the protection of water facilities.

During the Second World War the FBI recognized that:

Water supply facilities offer a particularly vulnerable point of attack to the foreign agent, due to the strategic position they occupy in keeping the wheels of industry turning and in preserving the health and morale of the American populace. (Lorenz. 2003, p.29)

The rules for protection of water facilities in time of conflict, the changing character of conflict, increasing use of terrorism, and the lack of clarity in the law have all contributed to an unstable situation.

The International Committee of the Red Cross (IRC) and other organizations have documented numerous cases where the destruction of a regional water supply, as a result of armed conflict, resulted in widespread suffering for the local population:

- International-aid workers calculated the real costs of the Israeli invasion of the Palestinian areas in 2002. Estimating that a total of more than US\$361 million, worth of destruction, was inflicted on Palestinian infrastructure, public institutions and private property. Officials from the World Bank and the United Nations concluded that more than US\$87.9 million (around 25% of the estimated real cost) damage was done to basic infrastructure, such as roads, power stations, sewers and water treatment facilities (Lorenz. 2003). This demonstrates that when public infrastructure is affected, water facilities are just one component of the problem;
- “Surgical strikes” during the Gulf War against power supply system in Iraq resulted in a significant deterioration of drinking water supplies, and severe consequences for public health. The consequences of international sanctions on water supply present a related issue;
- The interconnect nature of water facilities with infrastructure such as electrical systems and bridges makes them highly vulnerable to disruption during times of armed conflict. Recent conflict between Israel and Lebanon gives a clear sample; the total destruction of many villages in the south of Lebanon, the displacement of nearly quarter of the Lebanese population, the huge damages made to the infrastructure (bridges, airports, power plants, roads, etc.), resulted in a significant deterioration of water supply, and severe consequences for public health. (ibid. 2003)

International Law has evolved as the nature of conflict has changed, but has yet to respond to the increasing phenomenon of intra- rather than interstate conflict, or to the rise of terrorism. Most conventions and treaties were designed to cover conflicts of an international character.

Little attention has been given to the implications of possible terrorist attacks on water facilities, especially in view of development of chemical and biological threats.

1) Terrorism and the threat against water facilities

The past decade has shown that internal conflicts are now more common and just as destructive in terms of human suffering, and terrorism is playing a much greater role. Protection of civilian population from a terrorist attack on a water facility is an issue that has been rarely discussed in the literature, as terrorist attacks can be expected to increase in the years ahead.

The threat of international terrorism has dramatically increased over the past ten years, but a common international definition has been difficult to achieve. Attacks against civilians are viewed differently in many parts of the world, especially in the Middle East. Many Muslim leaders, for example, who condemned the attacks on the United States, have long refused to denounce terrorism directed at Israel. Some believe that the prohibition of killing non-combatants does not apply to Israel, where they claim settlers use force to take Palestinians land.

A number of recent criminal or terrorist attacks have been directed at water facilities, including the dumping of chemicals into the Meuse River in France, the placing of a bomb in a water reservoir in South Africa, and the destruction of water pipes in the Israeli settlement of Yitzhar. (Lorenz. 2003, p. 26-28)

There is little coordination of effort to protect critical water infrastructure on the international level. A successful attack would cause widespread panic and a loss of public confidence in water supply systems. There are many uncertainties in dealing with a potential attack on water facilities.

Questions of detection, the nature of the response, and coordination are just a few of the issues. Nations can use their domestic law to prosecute a terrorist attack on a water facility, but the suspect is likely to flee the country soon after.

The repatriation of the suspect to the state where the incident occurred often does not happen. If the incident occurs in international waters there is even less certainty that the terrorist would be brought to justice.

The customary law of armed conflict and the Geneva Conventions apply only in times of war or armed conflict. Terrorist activity is not limited to ongoing conflicts or near war zones. Small groups may operate with little or no centralized structure, and this can make apprehension and prosecution more difficult.

Existing international legal obligations and state practice can be strengthened and clarified. Improve coordination between states, with appropriate funding, can reduce the threat to water facilities around the globe.

The United Nations can provide the necessary framework, based on a comprehensive legal regime.

2) *An adequate degree of protection or weakness in the existing law.*

The United Nations during its General Assembly in December 1999 (International Convention for the Suppression of the Financing of terrorism), adopted a draft, which states:

Criminal acts intended or calculated to provoke a state of terror in the general public, a group of persons or particular persons for political purposes are in any circumstances unjustifiable, whatever the considerations of a political, philosophical, ideological, racial, ethnic, religious, or other nature that may be invoked to justify them.

Large numbers of innocent people can be put at risk by relatively unsophisticated methods, recent world events shown. A number of international conventions condemn conduct that can be described as terrorism. Each jurisdiction or state proscribes certain conduct under its criminal code. (Lorenz. 2003, p. 28-31)

5.4 Religions Standing

Many consider water as a gift given to us by God; a gift is here to sustain, to purify and to enrich our life and the life of the creation.

Taking into consideration all spiritual, practical and social aspects of this vital resource in history of humankind, the questions are:

- What is happening in our relation to water?
- Do we acknowledge the value of our water?

Although it carries a deep meaning, water is mentioned in the Bible as the resource of the new life, symbol of the spiritual purification and transformation. In Judaism, in Islam and actually in all worlds and natural religions water also has the same level of spiritual meanings. Moreover, they are aware of water as a condition for life and acknowledge this fact in their particular way.

Recognizing water as the central place in the practices and beliefs of all worlds and natural religions, this recognition is based on two main beliefs:

- Water washes away impurities and wastes, it can make an object look as good as new and wipe away any signs of previous defilement. Furthermore, water can make a person clean, externally or spiritually, and ready when attending religious services;

- Without water there is no life, thus water has the power to destroy as well as to create.

This significance of water manifests itself differently in various religions and beliefs, but it is these two qualities that underlie its central place in our cultures and faiths.

5.4.1 Islam and Water issues

Shari'a or Islamic law covers all aspects of the Islamic faith, including beliefs and practices. *Shari'a* is derived primarily from the Koran and the *Sunnah* (the way of life of the Prophet Muhammad (Peace be upon him (pbuh): a phrase that Muslims often say after saying the name of the prophet of Islam), as known from *Hadith*, or documented narrations of what the Prophet said and did), and also through *Ijtihad* (inquiry, interpretation, and innovation by Muslim scholars). To be academically valid, the presentation of the Islamic perspective on any issue must be based upon these sources, particularly the first two.

Water is of profound importance in Islam. It is considered a blessing from God that gives and sustains life, and purifies humankind and the earth (Faruqi, Biswas and Bino. 2001).

The Arabic word for water (*ma'* ماء) is mentioned sixty-three times in the Koran. God's throne is described as resting on water, and Paradise is described as "*Gardens beneath which rivers flow.*"

"*And Allah has sent down the water from the sky and therewith gives life to the earth after its death.*" Not only does water give life, but also every life is itself made of water: "*We made from water every living thing.*" (ibid. 2001)

All human beings rely on water for life and good health but, for Muslims, it enjoys special importance for its use in *Wudu* (ablution that is, washing before prayer) and *Ghusl* (bathing).

In Islam, ritual purity (*Tahara*) is required before carrying out religious duties especially worship (*Salat*). Muslims must be ritually pure before approaching God in prayer.

There are three kinds of ablutions in Islam:

- *Ghusl*, the major ablution, is the washing of the whole body in pure water, after declaring the intention to do so. Muslims are obliged to perform *ghusl* after sex, which incurs a state of major ritual impurity. *Ghusl* is also

recommended before the Friday prayer, the two main feasts, and before touching the Koran. *Ghusl* must be done for the dead before they are buried;

- *Wudu*, the minor ablution, which is performed to remove minor ritual impurity from everyday life. This must be done before each of the five daily prayers and involves using pure water to wash the face with pure water, rub the head with water and wash the hands and arms up to the elbows and the feet up to the ankles. This comes from the Koran 5: 7/8 “*O you who believe, when you prepare for prayer, wash your faces and your hand to the elbows; rub your head and your feet to the ankles*” and is elaborated on in great detail in the Sunna. Every mosque has running water for *Wudu*;
- The third type of ablution is performed when no water is available. In this case clean sand may be used.

The Islamic Shariah is one of the fundamental sources of water legislation in the Islamic world, as it embodies many principles, which are listed in part as follows:

- Water is the common property of all. There should be no obstruction to its use and exploitation though its ownership is allowed, especially when it comes to groundwater;
- The use of water by man and animals for drinking has priority over other uses even if it is meant to perform acts of worship. Therefore, nobody is allowed to prevent supplying man and animals with drinking water.

The Prophet (pbuh) stated that among the three people Allah will ignore on the judgment day are “*a man [who] possessed superfluous water on a way and he withheld it from the travellers.*”

The recognition of water as a vital resource, of which everyone has the right to a fair share of it, is emphasized by the following *Hadith*, which effectively makes water a community resource to which all, rich or poor, have a right: “*Muslims have common share in three things: grass (pasture), water and fire (fuel).*” (ibid. 2001)

The Prophet (pbuh) said, “*There is a reward for serving any animate (living) being,*” and “*He who digs a well in the desert . . . cannot prevent the animals from slaking their thirst at this well.*” (ibid. 2001)

The immense value of giving water to any creature is reflected by the following *Hadith*: “*A prostitute was forgiven by Allah, because, passing by a panting dog near a well and seeing that the dog was about to die of thirst, she took off her*

shoe, and tying it with her head-cover she drew out some water for it. So, Allah forgave her because of that.” (ibid. 2001)

1) Water Conservation and Treated Wastewater

The Koran makes two clear statements regarding water that support water demand management:

- First, the supply of water is fixed, so demand must be managed because supplies cannot be infinitely increased: "*And we send down water from the sky in fixed measure*"; (ibid. 2001)
- Second, it should not be wasted. As water supply is fixed, The Koran tells humans that they may use God's gifts for their alimentation in moderation, provided that they commit no excess therein: "*O Children of Adam! . . . Eat and drink: But waste not by excess, for God loveth not the wasters.*" (ibid. 2001)

Given the importance of cleanliness in Islam, and that many Muslim countries have minimal wastewater treatment, it is common to hear Muslims declare that wastewater reuse is undesirable, or even *Haram* (unlawful according to Islam). However, after a detailed study, in consultation with scientists and engineers, the Council of Leading Islamic Scholars (CLIS) in Saudi Arabia concluded in a special *Fatwa* in 1978 that treated wastewater can theoretically be used even for *Wudu* and drinking, provided that it presents no health risk. (ibid. 2001)

2) Water Rights in Islam

From an economic perspective, the Prophet (pbuh) said that, like fire and pasture, water is a common right to all Muslims (ibid. 2001). Moreover, according to modern legislation water is owned by society.

Market approaches to water management, such as increasing tariffs and privatizing utilities, are controversial because water is such a vital social good. Economic measures may be even more controversial in predominantly Muslim nations because of the Islamic precept that water cannot be bought or sold. (ibid. 2001)

However, most Islamic scholars have concluded that individuals or groups have the clear right to use, sell, and recover value-added costs of most categories of water. These judgements are based primarily on a *Hadith*: "*It is better . . . to go to the woods, [and] cut and sell lumber to feed himself . . . than to beg people for help,*"

which implies that common property resources such as wood and water can be sold and traded. (Faruqui. 2001)

As in Christianity and Judaism, in Islam humankind has the first right to the resources that God has provided for his creation. It is well accepted by Islamic scholars that the priority of water use rights is:

- First, *Haq al Shafa* or *Shirb*, the law of thirst or the right of humans to drink or satisfy their thirst;
- Second, *Haq al Shafa*, the right of cattle and household animals;
- Third, the right of irrigation.

However, the environment has clear and unmistakable rights in Islam.

3) Islamic Water Principles

A Workshop on Water Resources Management in the Islamic World (WRMIW) was held in Amman, Jordan, in December 1998, and was organized by the International Development Research Centre (IDRC) with support from the International Water Resources Association (IWRA), and the Inter-Islamic Network on Water Resources Demand and Management (INWRDAM). The workshop goals focused on developing better understanding of Islamic perspectives relating to selected water management practices, and outlining research necessary to educate water management policies that will improve the lives of the poor.

Although the workshop participants were able to agree upon water management principles that could be considered Islamic, these principles are not unique. As one delves into Islam, one encounters values common to the other two Abrahamic monotheistic religions, Christianity and Judaism, whose holy books Muslims recognize (*Abrahamic religion* is a term of Islamic origin, commonly used to designate the three prevalent monotheistic religions – Judaism, Christianity, and Islam – which claim Abraham (Hebrew: *Avraham* אַבְרָהָם ; Arabic: *Ibrahim* إبراهيم) as a part of their sacred history. Other, smaller religions that identify with this tradition – such as the Baha'i Faith – are sometimes included. Abrahamic religions account for more than half of the world's total population. Today, there are around 3.8 billion followers of various Abrahamic religions. Other comparable religious groupings include the Indian "religions" (way of life) and the Taoic religions of East Asia - both terms being parallels of the "Abrahamic" category).

Thus, a water conservation project incorporating local values in, for example, Egypt, which has a large Christian minority, could include verses from the Bible, as

well as those from the Koran and *Hadiths*, which would complement each other. Because these values are universal, they are not common only to these closely related faiths, but are also inherent in many other belief systems.

However, examining values is not easy. Most scientists and even development professionals avoid examining religion or values in the context of their work to avoid discord and to keep discussion “objective.” Nevertheless, where science, development, and values intersect, the issue cannot be avoided.

Examining values can be particularly sensitive in the Middle East, where the prevailing religion is Islam, but which also has many adherents of other faiths, such as Christianity, Zoroastrianism [a religion based on concept of struggle between light (good) and dark (evil), and philosophy based on the teachings ascribed to the prophet Zoroaster (Zarathustra, Zartosht)]. *Mazdaism* is the religion that acknowledges the divine authority of Ahura Mazda, proclaimed by Zoroaster to be the one uncreated Creator of all God. As demonstrated by Zoroastrian creed and articles of faith, the two terms are effectively synonymous. In a declaration of the creed — the *Fravarānē* — the adherent states: “...I profess myself a devotee of Mazda, a follower of Zarathustra.” (*Yasna* 12.2, 12.8) While Zoroastrianism was once the dominant religion of much of Greater Iran, the number of adherents has dwindled to no more than 200,000 worldwide, with concentrations in India and Iran], and Judaism. However, in a spirit of tolerance and mutual respect, workshop participants reached consensus that followers of different belief systems have much to learn from each other.

The workshop participants reached a consensus on Islamic water management principles, which can be outlined as follow: (Faruqui. 2001)

- Water is first and foremost a social good in Islam, a gift from God and a part of, and necessary for, sustaining all life;
- Water belongs to the community, as a whole, no individual literally owns water;
- The first priority for water use is access to drinking water of acceptable quantity and quality to sustain human life and every human being has the right to this basic water requirement;
- The second and third priorities for water are for domestic animals and for irrigation;
- Humankind is the steward of water on earth;

- The environment (both flora and fauna) has a very strong and legitimate right to water and it is vital to protect the environment by minimizing pollution. Individuals, organizations, and states are liable for harm that they have caused to the environment or to the environmental rights of others, including water use rights;
- Water resources must be managed and used in a sustainable way;
- Sustainable and equitable water management ultimately depends upon the application of universal values such as fairness, equity, and concern for others;
- Water conservation is central to Islam. Mosques, religious institutes, and religious schools should be used to disseminate this principle so as to complement other religious and secular efforts;
- Wastewater reuse is permissible in Islam; however, the water must meet the required level of treatment to ensure purity and health for its intended purpose;
- Full cost recovery is permissible: that is, the full cost of supplying, treating, storing, and distributing water, as well as the cost of waste-water collection, treatment, and disposal. However, water pricing must be equitable as well as efficient;
- Privatization of water service delivery is permissible in Islam, but the government has a duty to ensure equity in pricing and service;
- Water management requires *Shura* (consultation) with all stakeholders;
- All community members, including both men and women, can play an effective role in water management and should be encouraged to do so;
- Communities must be proactive to ensure equitable access to water resources;
- All nation-states have an obligation to share water fairly with other nation-states;
- Integrated water management is a necessary tool to balance equity across sectors and regions.

On the other hand there were recommendations: (ibid. 2001)

- Cooperation and sharing of knowledge of water resource management should be encouraged among Muslim scientists and countries by developing a network to promote equity;

- For the same purpose, cooperation and sharing of knowledge of water resource management should also be encouraged among scientists and countries regardless of religion;
- Non-economic incentives for conserving water, as well as penalties for wasting it, should be identified;
- Wastewater should be properly treated and reused.

The most important findings are the following:

- Water is a social good owned by the community. Provided that equity is maintained, as in Iran where all urban residents receive a lifeline volume of water free to meet their basic requirements, Islam allows for private sector involvement in service delivery, and up-to-full-cost recovery for water and wastewater treatment services;
- In contrast to the current situation in the Middle East, the priority of water rights is first, domestic uses, second, livestock watering, and third, irrigation. The environment has very strong and specific water rights, and individuals, organizations, and states are liable for harm they caused to the environment, which allows for “polluter pays” legislation;
- As indicated by the *Fatwa* and actual practice in Saudi Arabia, wastewater reuse is allowable, and encouraged where necessary, provided that the water is treated to the extent that makes it safe for its intended use.

5.4.2 Judaism and Water

In Judaism ritual washing is intended to restore or maintain a state of ritual purity and its origins can be found in the Torah. These ablutions can be washing the hands, the hands and the feet, or total immersion which must be done in “living water”, i.e. the sea, a river, a spring or in a *Mikveh* (it is a Jewish ritual bath used for cleansing after contact with a dead body or after menstruation. It can also be used for immersing vessels and as part of the initiation ceremony for converts. Only water that has not previously been drawn into a container can be used, and there must be no leakages. The *mikveh* has its origins in Ancient times when people had to be purified in a *mikveh* before they could enter the Temple area. Water in this case is important for its cleansing properties). (Juriga. 2003)

In Temple times ablutions were practised by priests, converts to Judaism as part of the initiation rites and by women on the seventh day after their menstrual period. Priests had to wash their hands and feet before taking part in Temple

services. The ritual washing of hands is performed before and after meals and on many other occasions.

Two stories reflect the significance of water in Judaism:

- The Great Flood in Genesis 6: 14-18. The significance of this is that the flood washed away all the sins of the world so that we could start afresh (God destroyed humanity by sending a great flood. Only Noah and his family and a two of each mammalian species were saved in the ark built by him. Afterwards God promised he would never attempt to destroy the earth again and sent the rainbow as a sign of this covenant. The story of a Great Flood is also found in other cultures such as the Australian Aborigines and some Pacific Islanders. The Israelites' story is different from these because it emphasises the ethical demands of God. The flood is a divine punishment from which Noah survives because of his moral worth); (ibid, 2003)
- The parting and crossing of the Red Sea in Jewish history. Water here is powerful, but an instrument of God for punishment "for the Egyptians" and a blessing "for the Israelites" (The Red Sea is significant in Jewish history because its parting by Moses was a miraculous event at the beginning of the Exodus which enabled the Israelites to escape from the Egyptian army that was chasing them. God allowed Moses to part the sea so that the Israelites could walk safely to the other side on dry land, while the Egyptians drowned as the sea came together again. This miracle was a reward for the faith of Moses and the Israelites, God's Chosen People. The parting and crossing of the Red Sea shows that God has power over nature, even the mighty oceans).

"All those wishing to win our cooperation in this sphere must realize one thing. For Israel, water is no luxury, not even merely a highly desirable and useful addition to our system of natural resources. Water for us is life itself. It is food for the people and not food alone. Without large scale irrigation projects we shall not achieve high productivity, balancing the economy or economic independence. For without irrigation we shall not at all produce a worthy agriculture under our special circumstances, and without agriculture particularly highly developed and progressive agriculture shall not be a people rooted in the land, secure in its existence, stable in its character, in control of all the possibilities of material and spiritual creation inherent in it and which this country can open before it." (See appendix 2, annex 2)

5.4.3 Water in Christianity

Almost all Christian churches or sects have an initiation ritual involving the use of water. Baptism has its origins in the symbolism from the baptism of Jesus by John the Baptist in the Jordan River. After Jesus' resurrection he commanded his disciples to baptise in the name of the Father, the Son, and the Holy Spirit (Matthew 28:19-20). Baptism is regarded differently in different denominations within Christendom. Baptism is a symbol of liberation from the oppression of sin that separates us from God.

It is believed that baptism does not in itself cleanse one from sin, but is rather a public declaration of a person's belief and faith in Christ and it is a sign of welcome into the Church. The Catholic Church, however, believes that a real change occurs at baptism (it is more than just symbolism) it is at baptism that Catholics believe that the stain of original sin is actually removed from the individual.

The use of water is important for its own symbolic value in three ways:

- It cleanses and washes away dirt;
- Fills everything it enters as God fills those who are immersed in Him;
- And we need water to survive physically as we need God to survive spiritually.

Baptism was usually performed with the person standing in water and with water being poured over the upper part of the body. This was called "immersion" but today the term refers to the method of dipping the whole body under water, which is used, for example, by the Baptist and Orthodox churches.

In most Western churches today the rite is performed by pouring water over the head three times (affusion) and sometimes sprinkling water over the head (aspersion).

Another important significance of water for Christianity is the "living water" that Jesus described himself as. John 4: 1-42 is the story of Jesus and a Samaritan woman (see appendix I, annex 5, part a, for more details) to whom he offers living water so that she will never thirst again, in other words eternal life through him.

Holy water (See appendix I, annex 8, for more details) is water blessed for use in certain rite (s), especially that which is blessed at the Easter Vigil for baptism of catechumens. The use of water other than for baptism goes back to the 4th century in the East and the 5th century in the West. (Juriga. 2003)

The custom of sprinkling people with water at mass began in the 9th century. At this time “stoups”, basins for holy water from which people could sprinkle themselves on entering a church, were in common use. Holy water is also used at blessings, dedications, exorcisms and burials.

Ablutions in Christianity are mainly baptism and the washing of fingers and communion vessels after the communion. This takes place in two parts: Firstly the chalice is rinsed with the wine, and then the chalice and priests’ fingers with wine and water. This ablution is important because after the bread and wine has been consecrated, Christ is believed to be present.

The President of the Pontifical Council on Justice and Peace Archbishop Renato R. Martino set out the Vatican’s position in a note submitted to the World Water Forum on March 22, 2003. Entitled *“Water, an Essential Element for Life,”* Archbishop Martino’s Note says: (See appendix 5, annex 1)

“Water is a common good of humankind. This is the basis for cooperation toward a water policy that gives priority to persons living in poverty and those living in areas endowed with fewer resources.” (ibid. 2003)

“The principle of the universal destination of the goods of creation confirms that people and countries, including future generations, have the right to fundamental access to those goods which are necessary for their development,” the Note states.

“The few, with the means to control, cannot destroy or exhaust this resource, which is destined for the use of all. Powerful international interests, public and private, must adapt their agendas to serve human needs rather than dominate them.” (ibid. 2003)

The Note calls for country partnerships between developed and developing countries, as well as debt for water swaps.

“The water services in many developing countries are, however, still plainly inadequate in providing safe water supplies. The situation is so dramatic that it will not be overcome without increased development assistance and focused private investment from abroad,” Archbishop Marino emphasizes in the Note.

“Funds released through debt relief could well be utilized in improving water services,” he says. *“Country partnerships can provide a method of institutional building and reform whereby a long term link can be formed between the water sector of a developed country and that of a developing country.”*

Since the water supply of most developed countries is in the public sector, this appeal appears closely aligned to the civil society calls for public-public partnerships as opposed to the public-private partnerships advocated by in past years by the World Bank, the Global Water Partnership, the water multinationals and several Western donors. *“Catholic social thought has always stressed that the defence and preservation of certain common goods, such as the natural and human environments, cannot be safeguarded simply by market forces, since they touch on fundamental human needs which escape market logic”.* (ibid. 2003)

In the Judeo-Christian Holy Book, God is presented as the source of living water beside which the just man can find life. Because the Bible was written in a part of the world where water is scarce, it is not surprising that water features significantly in the lives of the people. Due to the scarcity of water in the lands of the Scripture, rainfall and an abundance of water was seen as a sign of God's favour and goodness.

Water is a primary building block of life. Without water there is no life, yet water, despite its creative role, can destroy. The Bible opens precisely with the image of the divine spirit hovering over the water at the creation of the universe. In the accounts of creation contained in the first two chapters of the Bible, it is from the midst of the waters that dry land is made to appear, while living reptiles and rich life forms are made to swarm the waters. It is also water that moistens the earth for other forms of life to appear.

5.5 Conclusion

Water has been a cause of political tensions between the Arabs and the Israelis. It is the only scarce resource for which there is no substitute, over which there is poorly developed international law, and the need for which is overwhelming, constant and immediate. International law may emphasize the doctrine of “equitable utilization” of water resources, but there is no clear definition of what this implies. (Barrett. 1994)

International law is not based on treaties alone, and customary law can complement treaty law in many ways. Treaties or Conventions may attain the status of customary law over time. Customary law may assist in clarifying treaty provisions, when the terms of the treaty are subject to interpretation.

A general overview of the principal of international water law, which is part of international law, provides more specific rules, which have their origins in both international custom and treaty law. The most important international water-related treaty is the 1997 UN International Watercourses Convention. Its main elements were examined under the sub-headings of “scope”, “substantive rules”, “procedural rules”, “institutional mechanisms” and “dispute settlement”.

Today’s conflicts result internal instability and ethno-political tension, rather than classic war between nations.

Furthermore, when people are forced to accept agreements that give them less than they had expected, or less than what they feel they deserve, they sometimes behave unwisely. Evidence from experimental economics shows a strong tendency to punish others even when the behaviour is self-destructive. Not to mention that terrorism interacts with behavioural factors.

Destruction and damage of water facilities, in conflict today, can be considered more likely. The consequences are more severe especially on the civilian population, which is becoming more vulnerable. Water facilities present an insecure target for terrorist attacks, particularly in developed countries that have not experienced conflict.

The lack of a widely accepted measure for equitably dividing shared water resources represents the major barrier to water’s role as an agent of peaceful relations.

Over the time nations began to realise that conduct during warfare should have limits, and the unwritten principles, which were generally followed by civilized nations to control warfare, and to protect the victims of war, rose to the status of customary international law. Despite the inherent difficulties, treaties are not only the best representation of local needs and settings, but they also carry the highest priority in international law. By encouraging local negotiations, global political issues could also be better avoided. Existing international legal obligations and state practices can be strengthened and clarified. Improve coordination between states, with appropriate funding, can reduce the threat to water facilities around the globe. The United Nations can provide the necessary framework, based on a comprehensive legal regime.

Economic considerations alone may not provide an acceptable solution to water allocation problems, especially to solve water allocation disputes between

nations. Although economic criteria have never been explicitly used to determine water allocations in an international treaty and, while in some cases States have compensated co-riparian for water, no international water market has ever been established.

Economic benefits have not been clearly used in allocating water, although economic principles have helped guide definitions of beneficial uses and have suggested baskets of benefits, including both water and non-water resources. These conclusions suggest a middle ground between the absolute uniqueness of each basin, and the feasibility of defining clear and authoritative guiding principles for allocations, which would work like a set of rules for all of the trans-boundary waters of the world.

The generalized guidelines offered for allocations, whether based on legal or economic equity, have difficulty capturing the geographic uniqueness of each of the world's international waterways, whether hydrological, political, or cultural aspects. Common property resources are not controlled by a single person and can be used without a price being paid. As a result of the free usage, an externality is created in which the current overuse of the resource harms those who might use it in the future. The standard economic model suggests that people are rational, and capture all available gains from trade. Many, for instance, would not give up their ideals, their values, their country, their family, or their religion for any amount of money.

The Coase theorem is a useful approach for figuring out why efficient political bargains are so problematic, but it is not a good description of the real world. Even though, if the true problems are "game-theoretic" in nature, "wise leadership" can have a disproportionate impact on the world.

According to the Coase Theorem, the bargaining solution will be efficient when property rights are clearly specified, when transactions costs are at minimum and close to zero, and when there is no strategic behaviour. As transactions costs are low or non-existing, the efficient level of emissions should be attainable. The question that arises is:

When transactions costs are high, can this seriously reduce the potential of the private property approach to identify the efficient level of emissions?

The assumption of modest (even zero) transaction costs in negotiating an agreed level of the externality and price is very "optimistic". There are financial and time costs involved in bargaining (not to mention "free rider" problems), if these costs

exceed benefits from agreement then bargaining will not occur. Also bargaining with small numbers often breaks down (wars do happen, terrorist attacks and...).

Even if bargaining is costless, a pessimistic interpretation suggests that, rather than cooperation, surplus division problems can only be resolved by force or threat of using force. Furthermore, negotiations will not necessarily produce Pareto efficiency with asymmetric information since there may be cheating or blackmail.

International agreements must be self-enforcing; this may mean that international water resources potentially cannot be managed as efficiently as international resources.

Because International agreements are voluntary, it may be supposed that individual countries will never sign any agreement that makes them worse off. Agreements can be either cooperative or non-cooperative; they are cooperative if the players can negotiate binding contracts that allow them to plan joint strategies. A game is non-cooperative if negotiation and enforcement of a binding contract are not possible.

Economic efficiency can be achieved without government intervention when the externality affects relatively few parties and when property rights are well specified.

The efficient use of the river depends on negotiations and agreement between the two interested parties. Negotiation costs, together with the costs of the implementation of the agreement (transaction costs), could be expected to be fairly modest. Furthermore, when parties can bargain without cost and to their mutual advantage, the resulting outcome will be efficient, regardless of how the property rights are specified. Also, voluntary negotiations among those affected parties will generate efficient bargain, and the notion that externalities can be internalised once property rights are established suggests that government intervention to deal with externalities is unnecessary.

However it is optimistic to suppose such things always occur. The game theory and the history of wars show that this is unrealistic. At best it can be seen that bargaining can alleviate some pollution issues provided property rights are well enforced.

There is no contradiction between what Islam says about water management and the emerging international consensus on the issue. In fact, the Islamic water management principles are not unique. Some of the same principles could be

derived by studying other faiths, their holy books, and the lives of their Prophets. As one delves into Islam, one encounters values common not only to the other two Abrahamic religions, Christianity and Judaism, but also to many other world-views and religions.

6 *Conflict or Cooperation – Case Studies*

6.1 Introduction

Conflict over water appears in Chapter 26 of the book of Genesis, where the herdsmen of Gerar strove with the herdsmen of Isaac over control of water wells. Other ancient links between water and conflict may be found in the writings of Herodotus. Despite water's links to conflict Jerome Delli Priscoli (1997) counters that the development of irrigation systems contributed to the development of communities and of civilization itself. (Yoffe and Wolf. 2002)

After highlighting the Hydro-political position and the status of the Jordan River Basin, this chapter shows a case study, which demonstrates that despite an existing conflict between two parties reaching an understanding, and/or an agreement, is possible. This can be done when the limits and fluctuations of water resources play a role in shaping political forces and national boundaries. And when the issue of water availability determines both where and how people live and influence the way in which they related to each other.

6.2 Background

The Jordan River basin is shared by Israel, Jordan, Syria, Lebanon and the Palestinian Territories (the West Bank and Gaza Strip). Through military action in the Arab-Israel wars of 1967 and 1973, Israel has come to control a significant part of the basin, leaving water-short Jordan and the Palestinians in a vulnerable position.

Because of its geopolitical position, the Jordan River basin had been described as having witnessed more severe international conflict over water than any other river system in the Middle East, and remains by far the most likely flashpoint for the future. (ibid. 2002)

6.2.1 *The Jordan River and its Hydro-political Position*

All of the countries and territories in and around the Jordan River watershed, except Lebanon, comprising Israel, Syria, Jordan, the West Bank, and Gaza Strip, are currently using between 95 per cent and more than 100 per cent of their annual renewable freshwater supply (ibid. 2002). In recent dry years, water consumption has routinely exceeded annual supply, the difference usually being made up through over-pumping of the fragile groundwater system. Water requirements for the year

2000 were around 2,000 Mm³ annually for Israel, approximately 130 % of renewable supplies, and 1,000 Mm³/yr, or 115 % of supplies for Jordan. Syrian water demand is expected to exceed available supply by 2010. (ibid. 2002)

In addition to a natural increase in demand for water due to growing populations and economies, the region faced dramatic demographic changes from at least three sources: Israel accommodated a million Soviet Jewish immigrants between 1990 and 2000, a 25 % increase over its population (Bank of Israel). Jordan absorbed 300,000 Palestinians expelled from Kuwait in the wake of the Gulf War (early 1990's). Finally, talks are being initiated over a greater level of autonomy of the Palestinians in the West Bank and Gaza. Presumably, an autonomous Palestine would strive to absorb and settle a number of the 2.2 million Palestinians registered worldwide as refugees. The absorption of any or all of these groups of immigrants would have profound impact on regional water demands.

In October 1994 the political situation in the region changed and Israel and Jordan signed a Peace Accord. As part of this treaty, Israel promised to provide an additional 50 Mm³/yr of water to its Arab neighbour. (See appendix 3, annex 1)

The water-related part of the 1994 treaty is significant because it opens the door to increased cooperation in water matters between two traditionally hostile countries. This is likely to prove important because, even with the division of water under the Peace Accord, there is still nowhere near enough water to meet the needs of the people living in the Jordan basin.

Experts predict that Israel, Jordan and the Palestinian Territories will be running a water deficit of 1-2 billion cubic meters a year by 2020. However, Israel and Jordan continue to disagree over the implementation of the treaty. During a drought in the winter of 1998/99 Israel proposed to halve the amount of water it is obliged to give Jordan, World Water and Environmental Engineering magazine reported.

Israel continues to move slowly on the dispute over water with the Palestinians. Under the Oslo agreement of 1995, Israel allowed Palestinians in the West Bank to abstract up to 80 Mm³/yr from the western aquifer, recognizing for the first time that the Palestinians have legitimate water rights in the West Bank.

6.2.2 The Jordan River Basin (see appendix 2, annex 1: map 3)

The Jordan River is a multinational river, flowing southwards for a total length of (approximately) 250 km through Lebanon, Syria, Israel, and Jordan. It is the third

largest perennial river in the Middle East. It receives most of its discharge from precipitation on the southern part of the Anti-Lebanon Range, and is joined by its largest tributary the Yarmouk River, which forms the present boundary between Syria and Jordan for 40 km before becoming the border between Israel and Jordan. The Jordan River watershed drains an area of 18,300 km² in five political entities Lebanon, Syria, Israel, Jordan, and the West Bank. With only 1,400 Mm³ of usable flow (annually flow 1992), the Jordan River is the smallest major watershed in the region, compared with the Nile with 74,000 Mm³/yr or the Euphrates at 32,000 Mm³/yr. (Naff and Matson 1984)

It may be classified on the basis of hydrology, hydrogeology, and water use into three sections:

1) *The upper Jordan-headwaters, the Huleh valley, and Lake Tiberias (Figure 6.2.a):*

Table 6.2.a: Annual discharge of the upper Jordan-headwaters

River	Riparian states	Flow (Mm³)	
		Mean	Range
<i>Dan</i>	<i>Israel</i>	<i>245</i>	<i>173-285</i>
<i>Hasbani</i>	<i>Lebanon</i>	<i>138</i>	<i>52-236</i>
<i>Banias</i>	<i>Syria/Israel</i>	<i>121</i>	<i>63-190</i>
TOTAL		504	298 - 711

Source: Naff and Matson 1984

Three springs make up the northern headwaters (or the upper Jordan-headwaters) of the Jordan River (Table 6.2.a):

- The Hasbani River derives most of its discharge from the Wazzani spring and group of springs on the uppermost Hasbani rising in Lebanon, with an average annual flow across the border of 138 Mm³/yr. It is important to note that over a recent twenty-year period, the flow of the Hasbani varied from 52 million to 236 Mm³/yr.
- The Banias in the Golan Heights is fed primarily from Hermon springs, averaging 121 Mm³/yr, during a recent twenty-year period it varied from 63 million to 190 Mm³/yr;
- The Dan, the largest spring at 245 Mm³/yr, varying from 173 million to 285 Mm³/yr and originating in Israel.

The streams from these springs converge 6 km into Israel and flow south to the Sea of Galilee (210 m below sea level).

a. The Huleh Valley (Table 6.2.b) (appendix 2, annex 3, part b)

The flow of the upper Jordan enters the Huleh valley (formerly Lake Huleh), where it is augmented by the flow of sub-lacustrine springs. Among the minor springs and seasonal watercourses, this contributes to the flow of the upper Jordan.

Table 6.2.b: Water budget of the Huleh valley

	<i>Mm³</i>
<i>Inflow into valley</i>	<i>504</i>
<i>Plus local run-off from Huleh to Jisr Banat Yaqub</i>	<i>140</i>
<i>Minus irrigation in valley</i>	<i>-100</i>
<i>Outflow into Lake Tiberias</i>	<i>544</i>

Source: Naff and Matson 1984

b. Lake Tiberias (Table 6.2.c) (appendix 2, annex 3, part a)

The north fork of the Jordan falls 200 m to Lake Tiberias (the Sea of Galilee), which lies 210 m below sea level. The upper Jordan contributes an average of 610 Mm³/yr to the lake, or 40% of Israel's total identified renewable water resources. An additional 130 Mm³/yr enters the lake as winter run-off from various wadis and in the form of discharge from springs that contain high salinity.

Table 6.2.c: Water budget of Lake Tiberias

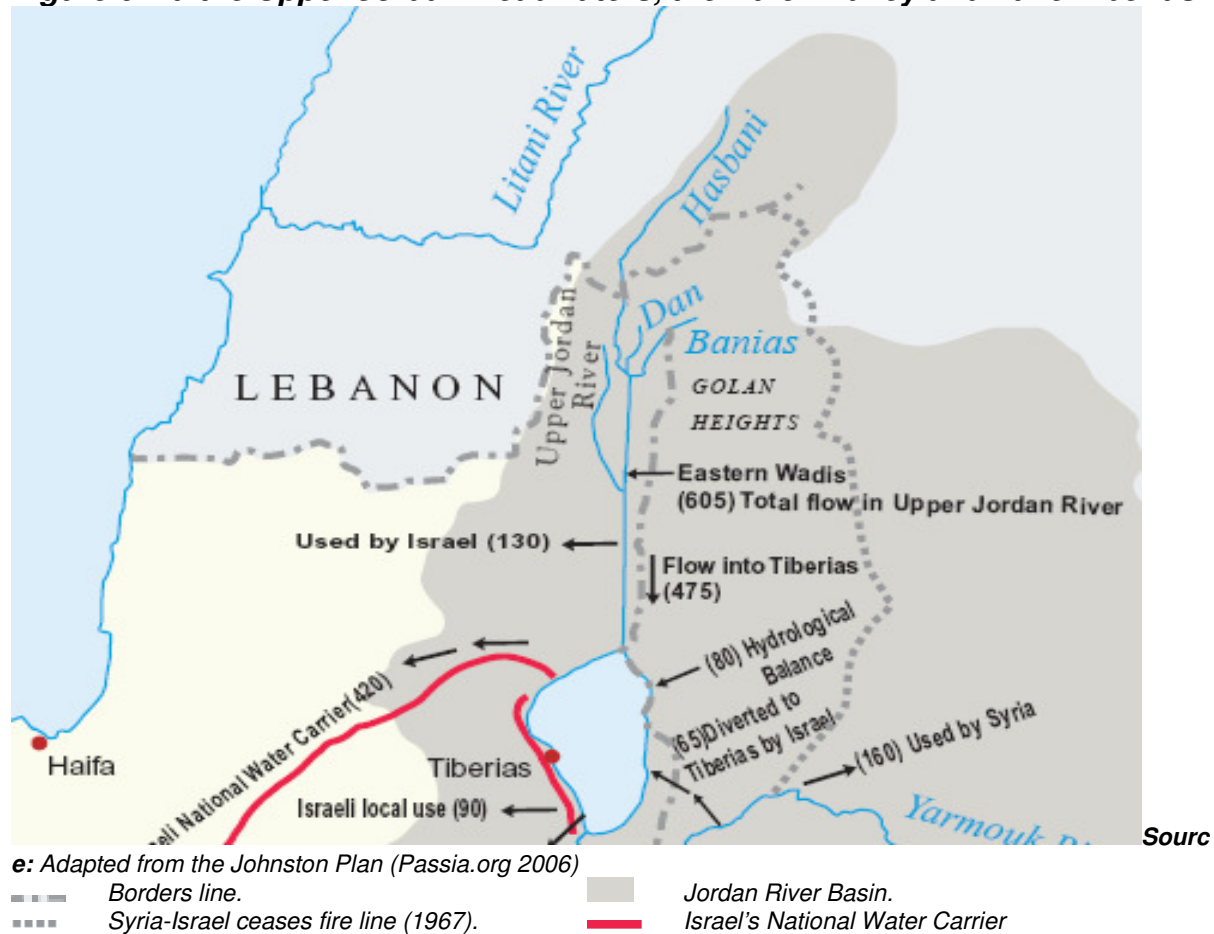
	<i>Mm³</i>
<i>Inflow into lake</i>	<i>544</i>
<i>Plus rainfall over lake</i>	<i>65</i>
<i>Plus local run-off</i>	<i>70</i>
<i>Plus springs in and around lake</i>	<i>65</i>
<i>Minus evaporation from lake surface</i>	<i>-270</i>
<i>Outflow to lower Jordan</i>	<i>474</i>

Source: Naff and Matson 1984

Lake Tiberias (figure 6.2.a) has a volume of 4×10^9 m³, which is 6.5 times the annual inflow from the upper Jordan River; the water depth is 26 m on average, with a maximum of 43 m. The surface area is 170 km², which loses about 270 Mm³/yr of water by direct evaporation. About 500 Mm³/yr leaves Lake Tiberias via its outlet and

flows south along the floor of the Dead Sea Rift for about 10 km to the confluence with the Yarmouk River.

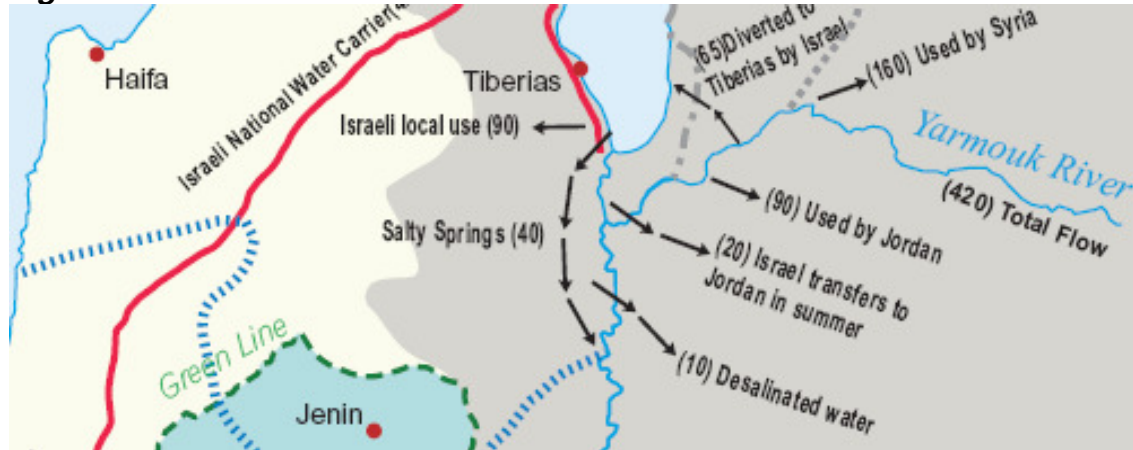
Figure 6.2.a the Upper Jordan-Headwaters, the Huleh Valley and Lake Tiberias



2) The Yarmouk River (Fig. 6.2.b):

The Yarmouk River has sources both in Syria and Jordan and forms the border between those countries before it adds about 400 Mm³/yr to the Jordan River, 10 km south of the Sea of Galilee. There is no flow contribution from the part of the valley where Israel is a riparian. Of the 7,242 km² of the Yarmouk basin, 1,424 km² lie within Jordan and 5,252 km² within Syria. The flow of the Yarmouk is derived from winter precipitation that averages 364 mm per year over the basin (Naff and Matson 1984).

Figure 6.2.b the Yarmouk River



Source: Adapted from the Johnston Plan (Passia.org 2006)

- Borders line.
- Syria-Israel cease fire line (1967).
- Groundwaters divide.
- Jordan River Basin.
- Israel's National Water Carrier.

3) The lower Jordan River and the Dead Sea (Fig. 6.2.c)

For the first 40 km the river forms the international boundary between Israel and Jordan; south of that reach, it abuts the Israeli-occupied West Bank of the Jordan, where it forms the present cease-fire line. The Jordan here flows through the deepest portion of the Rift valley to enter the Dead Sea at 401 m below sea level, the lowest point on earth.

Run-off from winter rainfall within the valley is carried to the Jordan River via steep, intermittent tributary wadis incised in the wall of the Jordan valley, primarily on the East Bank. This source represents an additional 523 Mm³/yr, of which only 20% originates in Israel; 286 Mm³ is derived from perennial spring flow, while 237 Mm³ is provided by winter rainfall (Naff and Matson 1984).

The Jordan River picks up volume from springs and intermittent tributaries along its 320 km (include the Hasbani River) meander southward along the valley floor of the Syrio-African Rift. Because much of the Jordan's flow is below sea level and the small springs that contribute to its flow pass first through the salty remains of ancient seas, the salinity of the water rises greatly even as its flow increases. Though the headwaters at the Hasbani, Baniyas and Dan have a salinity of 1520 parts per million (ppm), levels at the south end of the Sea of Galilee are 340 ppm. This is diluted to some extent by the Yarmouk, which has a salinity of 100 ppm, but increases significantly downstream, reaching several thousand parts per million by the Allenby Bridge near Jericho. The Dead Sea, a terminal lake, has a salinity of 250,000 ppm, seven times that of the ocean. (Naff and Matson 1984)

The river flows through the transition zone from the Mediterranean subtropical climate of Lebanon and the Galilee region in the north to the arid conditions of the Negev Desert and the Rift Valley to the south. Similarly, rainfall patterns vary spatially, with decreasing rainfall generally from north to south and from west to east.

Figure 6.2.c the Lower Jordan River and the Dead Sea



The hills along both banks of the Jordan serve as recharge areas for extensive aquifer systems in the West Bank, Israel, and Jordan. There are three principal aquifer systems west of Jordan, which they have the following safe yields:

- The north-east basin, which recharges in the northern West Bank and discharges in Israel's Bet She'an and Jezreel valleys, has a safe yield of 140 Mm³/yr;

- The western, or Yarkon-Tanninim basin, which also recharges in the hills of the West Bank but discharges westwards towards the Mediterranean coast in Israel, has a safe yield of 320 Mm³/yr;
- The eastern basin, which is made up of five separate catchment areas in the West Bank, all of which flow east toward the Jordan Valley, has a combined safe yield of 125 Mm³/yr.

The coastal aquifer, another major groundwater source in Israel but without hydrologic connection to those listed above, provides a safe yield of about 280 Mm³/yr. The Gaza aquifer, with connection to the coastal aquifer, provides an additional yield of 60 Mm³/yr, groundwater replenishment, within Jordan, totals about 270 Mm³/yr in 12 different aquifers mostly in the Zarqa, Yarmouk, and Jordan catchments.

These stream flow and groundwater recharge values represent the average annual values in the natural system. The actual amounts are highly variable and depend both on seasonal fluctuations (75 per cent of precipitation falls during the four winter months) and on annual variations in rainfall, which can be as high as 25-40 per cent.

Lebanon and Syria are respectively using about 35 Mm³/yr from the Hasbani River and about 250 Mm³/yr from the Yarmouk River, each for local irrigation projects. Their major sources are respectively the Litani River, with an average flow of 700 Mm³/yr and which lie entirely within Lebanon, and Euphrates River. Because the Litani River flows to within seven kilometers of the Hasbani River, it has been included in many planned diversion schemes in conjunction with the Jordan River.

6.3 Historical background

a- The Ionides Plan:

In 1937, the government of Great Britain assigned M. Ionides, a hydrologist, to serve as the director of development for the East Jordan Government. His actual task was solely to conduct a study on the water resources and irrigation potentials of the Jordan Valley Basin. This study served as a main reference in the preparation of the proposed United Nations Partition Plan of Palestine.

Published in 1939, the Ionides Plan made three recommendations:

- Yarmouk flood waters were to be stored in Lake Tiberias;

- The stored waters plus a block quote quantity (1.76 m³/sec) of the Yarmouk River water, diverted through the East Ghor canal, were to be used to irrigate 75,000 acres (300,000 dunums: A unit of area used in the Ottoman Empire and still used, in various standardized versions, in many countries formerly part of the Ottoman Empire. It was defined as “forty standard paces in length and breadth”, but varied considerably from place to place) of land east of the Jordan River;
- The secured irrigation water of the Jordan River System, estimated at a potential of 742 Mm³, were to be used primarily within the Jordan Valley Basin.

Since the Jordan and the Yarmouk Rivers were at that time still under the authority of the Palestine Electricity Corporation, the plan was difficult to implement.

b- The Lowdermilk Plan:

Zionist supporters worldwide were not satisfied with the findings and recommendations of Ionides. Their aspiration to utilize the Jordan River Basin for the irrigation of the Negev and the southern parts of Palestine was fulfilled by *Walterclay Lowdermilk*. Lowdermilk was commissioned by the United States Department of Agriculture to conduct such a study.

Lowdermilk devised a plan calling for the irrigation of the Jordan Valley, the diversion of the Jordan and Yarmouk rivers to create hydroelectric power; the diversion of water from northern Palestine to the Negev desert in the south; and the usage of the Litani River in Lebanon.

In striking contrast to the Ionides plan, Lowdermilk concluded that 1800 Mm³ of water was available in the Jordan Basin for the purpose of irrigation. A canal was recommended to connect the Mediterranean Sea with the Dead Sea. Also, an authority similar to the Tennessee Valley Authority should be formed to assume full control over all activities concerning water resources. Such water management would ideally ensure adequate water resources and job opportunities for 4 million new Jewish immigrants in addition to the 1.8 million Arabs living in Palestine and East Jordan at that time.

Control over the proposed project should be solely in the hands of Jews, with a limited amount of input allotted to the United Nations. Arabs unable or unwilling to live under such conditions were to be transferred to areas near the Euphrates and the Tigris Valley.

Lowdermilk's plan and suggestions were enthusiastically embraced by influential Zionists. Technical experts subsequently contracted to implement and interpret this plan into feasible schemes. James B. Hays was selected for this assignment.

c- The Hays Plan

The Hays plan of 1948 called for half of the Yarmouk River water to be diverted into Lake Tiberias, replacing water diverted from the upper Jordan River, as outlined in the Lowdermilk plan from which Hays worked. Two additional stages were suggested to be implemented in the future, although not stated, they most likely included the diversion of the Litani River water into geographical Palestine in order to be used for Israeli projects.

As a continuation of the Lowdermilk-Hays Plan, the new government of Israel, soon after the War of 1948, began to prepare practical plans for the utilization and control of the area's water resources. A Seven Year Plan was approved publicly in 1953, centred on the diversion of the Jordan River water south toward the Negev Desert and establishing a unified and comprehensive water network that would cover all parts of Israel.

In September 1953, the construction of the National Water Carrier began and thus plans to divert the Jordan River water, south to the Negev, were activated. Diversion originated at the Banat Yacoub Bridge in the demilitarized zone between Israel and Syria. After Syrian objection to the excavation process, and United States' economic sanctions against Israel, a temporary freeze on the work at Banat Yacoub Bridge was announced in October 1953.

During the 1948 war, the Rutenberg electricity generating plant was destroyed by the Jewish army in an attempt to avoid exclusive Arab control over the use of the Jordan and Yarmouk Rivers. The war forced a great number of Palestinian refugees to flee and settle in the eastern part of the Jordan Valley. The Jordanian Government and the United Nations Relief and Works Agency (UNRWA) agreed to develop irrigation schemes in the area to assist Palestinian refugees to cultivate the land and resettle. For this purpose, the Jordanian Government commissioned a British consultant, Sir Murdoch MacDonald, to conduct a study on their behalf.

d- The McDonald Plan

The McDonald Plan was finalized in 1951. It is considered a complement to the Ionides Plan. The plan called for Jordan Basin water to be exclusively used for

irrigation of both banks of the Jordan River by storing surplus water from the Yarmouk River in Lake Tiberias and constructing canals down both sides of the Valley. Arabs were uneasy with the suggestion of the storage of water in Lake Tiberias, as they were in previous plans.

e- The Bunger Plan

The Arabs favoured the plan put forward by the American engineer M. E. Bunger a suitable location for the construction of a water storage dam along the Yarmouk River at the Moqarin area, where three valleys join together. The impounded water would be diverted to another dam at Addassiyah into gravity flow canals along the East Ghore area in the Jordan Valley. The plan included two hydroelectric generating plants at the site of the two dams to supply water and electricity to both Jordan and Syria.

The Bunger Plan addressed several of Jordan and Syria's needs, and intended to resolve, to some extent, the Palestinian refugees' problem by increasing the productivity of available agriculture lands in the East Jordan Valley and parts of Syria. As soon as work began in July 1953, Israel vocalized its concern about increasing Arab control over the area's water resources. Israel objected on the grounds that the original Rutenberg Concession gave it exclusive rights to the Yarmouk River. As a result, pressure was exerted on the United States Government and UNRWA to cease support for the project. To the surprise of the Jordanian Government, work was halted soon thereafter and the project was terminated.

f- The Johnston Plan

In October 1953, the United States prepared the Johnston Plan as yet another attempt to solve the area's water crisis. The rising tension caused by the Israeli initiation of the National Water Carrier project, encouraged the United States to mediate between the two parties. The plan sought to satisfy the minimum requirements of riparian Arab states, as well as Israel. Eric Johnston implemented a water plan prepared by Charles Main, under the supervision of the Tennessee Valley Authority. Essentially, the Johnston Plan was a combination of the Lowdermilk-Hays and the MacDonald-Bunger Plans.

6.3.1 Johnston Negotiations, 1951-55; Yarmouk Mediations, 1980's

The Jordan River flows between five particularly contentious riparians, two of which rely on the river as the primary water supply. By the early 1950's, several states announced unilateral plans for the Jordan watershed. Arab states began to

discuss organized exploitation of two northern sources of the Jordan; the Hasbani and the Banias. (Stevens 1965)

The Israelis made public their “All Israel Plan” which included the draining of Huleh Lake and swamps, diversion of the northern Jordan River and construction of a carrier to the coastal plain and Negev Desert, the first out-of-basin transfer for the watershed in the region. (Naff and Matson 1984)

Jordan announced a plan to irrigate the East Ghor of the Jordan Valley by tapping the Yarmouk. At Jordan’s announcement, Israel closed the gates of an existing dam south of the Sea of Galilee and began draining the Huleh swamps, which infringed on the demilitarized zone with Syria. This action led to a series of border skirmishes between Israel and Syria, which escalated over the summer of 1951 and prompted Israeli Foreign Minister Moshe Sharrett to declare clearly that “Our soldiers in the north are defending the Jordan water sources so that water may be brought to the farmers of the Negev”. (Stevens. 1965)

In March 1953, Jordan and the U.N. Relief and Works Agency for Palestine Refugees (UNRWA) signed an agreement to begin implementing the “Bunger Plan”, which called for a dam at Maqarin on the Yarmouk River with a storage capacity of 480 Mm³, and a diversion dam at Addassiyah which would direct gravity flow along the East Ghor of the Jordan Valley.

The water would both open land for irrigation and provide power for Syria and Jordan and offer resettlement for 100,000 Palestinian refugees. In June 1953, Jordan and Syria agreed to share the Yarmouk but Israel protested that its riparian rights commonly recognized as being due to entities that border a waterway, were not being recognized. (Naff and Matson. 1984)

In July 1953, Israel began construction on the intake of its National Water Carrier at the Bridge of Jacob’s Daughters (Geshar B’not Ya’akov), north of the Sea of Galilee and in the demilitarized zone. Syria deployed its armed forces along the border and artillery units opened fire on the construction and engineering sites. Syria also protested to the U.N. and, though a 1954 resolution for the resumption of work by Israel carried a majority, the USSR vetoed the resolution. The Israelis then moved the intake to its current site at Eshed Kinrot on the north-western shore of the Sea of Galilee.

This was a doubly costly move for Israel. First, as mentioned earlier, water salinity is much higher in the lake than in the upper Jordan. The initial water pumped

in 1964 was actually unsuitable for some agriculture. Since that time, Israel has diverted saline springs away from the lake and filtered carrier water through artificial recharge to ease this problem (Stevens. 1965). Second, the water from B'not Ya'akov would have flowed to the Negev by gravity alone. Instead, 450 Mm³/yr is currently pumped a height of 250 m before it starts its 240 km journey southward.

Against this tense background, President Dwight Eisenhower sent his special envoy Eric Johnston to the Middle-east in October 1953 to try to mediate a comprehensive settlement of the Jordan River system allocations, and design a plan for its regional development. Johnston's initial proposals were based on a study carried out by Charles Main and the Tennessee Valley Authority (TVA) at the request of UNRWA to develop the area's water resources and to provide for refugee resettlement.

The TVA addressed the problem with a regional approach, pointedly ignoring political boundaries in their study. In the words of the introduction, "the report describes the elements of an efficient arrangement of water supply within the watershed of the Jordan River System. It does not consider political factors or attempt to set this system into the national boundaries now prevailing". (ibid. 1965)

6.3.2 Johnston negotiations 1953 - 1955

The large number of plans proposed between 1953 and 1955 represented bargaining stages in the negotiations over the sharing of the Jordan River. The main bargaining was based on:

- The water quotas for the riparian;
- The use of Lake Tiberias as a storage facility;
- The use of Jordan waters for out-of-basin areas;
- The use of the Litani River as part of the system;
- The nature of international supervision and guarantees.

The basic plan for Johnston's mission was an UNRWA-sponsored desk study prepared by Charles T. Main, under the supervision of the US Tennessee Valley Authority (as mentioned before), with the backing of the American State Department. The plan featured:

- A dam on the Hasbani to provide power and irrigate the Galilee area;
- Dams on the Dan and Baniyas Rivers to irrigate Galilee;
- Drainage of the Huleh swamps;

- A dam at Maqarin with 175 Mm³ storage capacities to be used for power generation;
- A dam at Addassiyah to divert water to Lake Tiberias and into the east Ghor area;
- A small dam at the outlet of Lake Tiberias to increase the lake's storage capacity;
- Gravity-flow canals down the east and west sides of the Jordan valley to irrigate the area between the Yarmouk and the Dead Sea;
- Control works and canals to utilize perennial flows from the valleys.

The major features of the Main Plan included small dams on the Hasbani, Dan, and Banias, a medium size (175 Mm³ for storage) dam at Maqarin, additional storage at the Sea of Galilee, and gravity flow canals down both sides of the Jordan Valley. Preliminary allocations gave Israel 394 Mm³/yr, Jordan 774 Mm³/yr, and Syria 45 Mm³/yr. (Table 6.3.a) In addition, the Main Plan:

- Described only in-basin use of the Jordan River water, although it conceded that "it is recognized that each of these countries may have different ideas about the specific areas within their boundaries to which these waters might be directed";
- Excluded the Litani River.

a- Israelis Cotton Plan:

Israel responded to the "Main Plan" with the "Cotton Plan", which it allocated Israel 1290 Mm³/yr, including 400 Mm³/yr from the Litani River, Jordan 575 Mm³/yr, Syria 30 Mm³/yr and Lebanon 450 Mm³/yr. In contrast to the Main Plan, the Cotton Plan:

- Called for out-of-basin transfers to the coastal plain and the Negev;
- Included the Litani River;
- Recommended the Sea of Galilee as the main storage facility, thereby diluting its salinity.

b- The Arab Plan

In 1954, representatives from Lebanon, Syria, Jordan, and Egypt established the Arab League Technical Committee under Egyptian leadership and formulated the "Arab Plan". Its principal difference from the Johnston Plan was in the water allocated to each state. Israel was to receive 182 Mm³/yr, Jordan 698 Mm³/yr, Syria

132 Mm³/yr, and Lebanon 35 Mm³/yr in addition to keeping all of the Litani River.

The Arab Plan:

- Reaffirmed in-basin use;
- Excluded the Litani River;
- Rejected storage in the Galilee, which lies wholly in Israel.

Johnston worked until the end of 1955 to reconcile these proposals in a Unified Plan amenable to all of the states involved. His dealings were bolstered by a U.S. offer to fund two-thirds of the development costs. His plan addressed the objections of both sides, and accomplished no small degree of compromise, although his neglect of groundwater issues would later prove an important oversight. Though they had not met face to face for these negotiations, all states agreed on the need for a regional approach. Israel gave up on integration of the Litani and the Arabs agreed to allow out-of-basin transfer.

Table 6.3.a: Johnston Negotiations. 1953-1955 water allocations to riparian of Jordan River system

Plan/Source ^a	Allocation (Mm ³ /yr)				
	Lebanon	Syria	Jordan	Israel	Total
Main Plan	Nil	45	774	394	1213
Arab Plan	35	132	698	182	1047
Cotton Plan	450.7	30	575	1290	2345.7
Unified (Johnston) Plan					
Hasbani	35				35
Banias		20		20	
Jordan (main stream)		22	100	375 ^b	497 ^b
Yarmouk		90	377	25	492
Side wadis			243	243	
Total Unified Plan	35	132	720	400 ^b	1287 ^b

Source: Naff and Matson (1984)

(a) The Cotton Plan included the Litani as part of the Jordan River system. Different plans allocated different amounts in accordance with differing estimates of the resources of the system. One major variable in the reporting of the planned allocations is the amount of groundwater included in the estimates.

(b) According to the compromise "Gardiner Formula", the share to Israel from the main stream of the Jordan was defined as the "residue" after the other co-riparians had received their shares. This would vary from year to year, but was expected to average 375 Mm³.

The Arabs objected, but finally agreed, to storage at both the Maqarin Dam and the Sea of Galilee, so long as neither side would have physical control over the

share available to the other. Israel objected, but finally agreed, to international supervision of withdrawals and construction. Allocations under the Unified Plan, later known as the Johnston Plan, included 400 Mm³/yr to Israel, 720 Mm³/yr to Jordan, 132 Mm³/yr to Syria and 35 Mm³/yr to Lebanon.

6.4 The Yarmouk River Negotiations

The Yarmouk River originates on the south-eastern slopes of Mount Hermon in a complex of valleys developed in Quaternary volcanic rocks. The main trunk of the Yarmouk River part forms the present boundary between Syria and Jordan for 40 km before it becomes the border between Jordan and Israel. Where it enters the Jordan River 10 km below Lake Tiberias, the Yarmouk contributes about 400 Mm³/yr.

There is no flow contribution from the part of the valley (wadi) where Israel is a riparian. From the 7,242 km² of the Yarmouk basin, 1,424 km² lie within Jordan and 5,252 km² within Syria. The flow of the Yarmouk is derived from winter precipitation that averages 364 mm per year over the basin (Naff and Matson 1984). The stream flow is supplemented by spring discharges from highly permeable zones in the lavas; some further spring discharges may be channeled to the surface on valley floors via solution pathways in the underlying lime stones.

The mean annual flow discharge is 400 Mm³/yr, which is 65% of the total discharge of 607 Mm³/yr from the Jordan's East Bank. The flow is largely influenced by the rainfall pattern in the Mediterranean climate, indicating a maximum monthly discharge of 101 Mm³ in February and a minimum of 19 Mm³ in September.

In 1952, Miles Bunger, an American attached to the Technical Cooperation Agency in Amman, first suggested the construction of a dam at Maqarin to help even the flow of the Yarmouk River and to tap its hydroelectric potential. The following year, Jordan and UNRWA signed an agreement to implement the Bunger plan the following year, including a dam at Maqarin with a storage capacity of 480 Mm³ and a diversion dam at Addassiyah, Syria and Jordan agreed that Syria would receive 2/3 of the hydropower generated, in exchange for Jordan's receiving 7/8 of the natural flow of the river. Dams along the Yarmouk were also included in the Johnston negotiations; the Main Plan included a small dam, 47 meters high with a storage capacity of only 47 Mm³, because initial planning called for the Sea of Galilee to be the central storage facility. As Arab resistance to Israeli control over Galilee storage

became clear in the course of the negotiations, a larger dam, 126 meters high with a storage capacity of 300 Mm³ was included.

While the idea faded with the Johnston negotiations, the idea of a dam on the Yarmouk was raised again in 1957, in a Soviet-Syrian Aid Agreement, and at the First Arab Summit in Cairo in 1964, as part of the All-Arab Diversion Project (see appendix 4, annex 1 and annex 2). Construction of the diversion dam at Mukheiba was actually begun, but was abandoned when the borders shifted after the 1967 war. One side of the projected dam in the Golan Heights shifted from Syrian to Israeli territory.

The Maqarin Dam was resurrected as an idea in Jordan's Seven Year Plan in 1975, and Jordanian water officials approached their Israeli counterparts about the low dam at Mukheiba in 1977. While the Israelis proved amenable at a ministerial-level meeting in Zurich, a more-even flow of the river would benefit all of the riparian; the Israeli government shifted that year to one less interested in the project.

This stalemate might have continued except for strong US involvement in 1980, when President Carter pledged a \$9 million loan towards the Maqarin project, and Congress approved an additional \$150 million, provided that all of the riparian agree. Philip Habib was sent to the region to help mediate an agreement. While Habib was able to gain consensus on the concept of the dam, on separating the question of the Yarmouk from that of West Bank allocations, and on the difficult question of summer flow allocations, 25 Mm³ would flow to Israel during the summer months, negotiations were suspended for winter flow allocations, and final ratification was never reached.

Syria and Jordan reaffirmed mutual commitment to a dam at Maqarin in 1987, whereby Jordan would receive 75% of the water stored in the proposed dam, and Syria would receive all of the hydropower generated. The agreement called for funding from the World Bank, who insisted that all riparian agree to a project before it can be funded. Israel refused until its concerns about the winter flow of the river were addressed.

Against this backdrop, Jordan in 1989 approached the US Department of State for help in resolving the dispute. Ambassador Richard Armitage was dispatched to the region in September 1989 to resume indirect mediation between Jordan and Israel where Philip Habib had left off a decade earlier. The points raised during the following year were as follows:

- Both sides agreed that 25 Mm³/yr would be made available to Israel during the summer months, but disagreed as to whether any additional water would be specifically earmarked for Israel during the winter months;
- The overall viability of a dam was also open to question, the Israelis still thought that the Sea of Galilee ought to be used as a regional reservoir, and both sides questioned what effects ongoing development by Syria at the headwaters of the Yarmouk would have on the dam's viability. Since the State Dept. had no mandate to approach Syria, their input was missing from the mediation;
- Israel eventually wanted a formal agreement with Jordan, a step, which would have been politically difficult for the Jordanians at the time.

By fall of 1990, the agreement seemed to be taking shape, by which Israel agreed to the concept of the dam, and discussions on a formal document and winter flow allocations could continue during construction, estimated for more than five years. Two issues held up agreement:

- First, the lack of Syrian input left questions of the future of the river unresolved, a point noted by both sides during the mediations;
- Second, the outbreak of the Gulf War in 1991 overwhelmed other regional issues, finally pre-empting talks on the Yarmouk.

The issue has not been brought up again until recently in the context of the Arab-Israeli peace negotiations.

In the absence of an agreement, both Syria and Israel are currently able to exceed their allocations from the Johnston accords, the former because of a series of small storage dams and the latter because of its downstream riparian position. Syria began building a series of small impoundment dams upstream from both Jordan and Israel in the mid-1980's, while Israel has been taking advantage of the lack of a storage facility to increase its withdrawals from the river.

Syria currently has 27 dams in place on the upper Yarmouk, with a combined storage capacity of approximately 250 Mm³ (its Johnston allocations are 90 Mm³/yr from the Yarmouk), and Israel currently uses 70-100 Mm³/yr (its Johnston allocations are 25-40 Mm³/yr). This leaves Jordan approximately 150 Mm³/yr for the East Ghor Canal (as compared to its Johnston allocations of 377 Mm³/yr).

6.5 “Picnic Table” negotiations 1991 – 1994

Israel and Jordan have had probably the warmest relations of any two states legally at war. Communication between the two continued since their independence, ameliorating conflict and facilitating conflict resolution on a variety of subjects, including water. The so called “Picnic Table Talks” on allocations of the Yarmouk have taken place since the 1950’s, and negotiations formulating principles for water-sharing projects and allocations have occurred in conjunction with, and parallel to, both the bilateral and multilateral peace negotiations.

In the 1980’s, a discreet agreement was reached between Jordan and Israel, to make arrangements on the Yarmouk River for sharing its water. These arrangements were made with the blessing of both sides’ leaders, but they did not constitute a formal agreement. Experts from the two sides, accompanied by officers of their respective armies and in the presence of officer of the United Nations Truce Supervision Organisation, met at the diversion point (Adassiya/Point121), for what is sometimes called the “Picnic table Meetings”, and were designed to respond to requests by either side to adjust the flow to either country, especially in the dry months. The meeting on the Yarmouk River served to create working relations and mutual respect between the water experts of the two sides, and to form some of the basis for the formal negotiations in the 1990’s.

Following the Madrid Conference Accord in October 1991, negotiations on water took place in a series of rounds, in Washington D.C., and later in the region, most of the time was in closed sessions, except for informal discussions that took place during coffee/tea breaks at which Americans and/or Russians were present. As both party’s attitude was to deal with each other directly, the presence of the Americans and the Russians, as “hosts” or as “facilitators”, was to overcome rough spots in the process and to offer some advices, but always maintaining a balanced non-interfering position.

An agreed common “Agenda” was signed on September 14, 1993 (appendix 3, annex 1); this was the day following the signing of the Declaration of Principles (DOP) between Israel, represented by Yitzhak Rabin, and the Palestinian Authority represented by Yasser Arafat in the presence of the American President Clinton, at the White House. It is worth mentioning that the common “Agenda” was ready many months before this date, but awaited an agreement between Israel and the

Palestinian Liberation Organisation (PLO) to open the road for the concrete negotiations between Jordan and Israel.

In February and again in June 1994, there were extended and very intensive meetings of the delegations of both countries in Washington, mainly based on the common “Agenda” signed in September 1993. In July 1994 the meeting moved to the region, the first being held in a large tent in the Araba/Arava Valley and the following ones in various venues in both countries.

The Water Agreement was finalized in the morning of October 17, 1994 at the Hashimiya Palace in Amman in the presence of King Hussein and other dignitaries from both countries, and the ceremonial signing of the Jordan-Israel Peace Treaty took place in the Araba/Arava Valley, north of the cities of Aqaba and Eliat, on October 26 1994.

6.6 Dealing with Water Rights

The term “Water Rights” was raised (especially during the negotiations between Israel and the Palestinians, with the Jordanians the agreement was “pragmatic”) during the negotiations leading up to the treaty. The Israelis, arguing that the entire region was running out of water, insisted on discussing only water “allocations”; that is, the future needs of each riparian. The Jordanians, in contrast, refused to discuss the future until past grievances had been addressed. They would not negotiate “allocations” until the historic question of water “rights” had been resolved. There is little room for bargaining between the past and the future, between “rights” and “allocations”. Negotiations reached an impasse until one of the mediators suggested the term “rightful allocations” to describe simultaneously historic claims and future goals for cooperative projects. This new term is now imbibed in the water-related causes of the Israel-Jordan Treaty of Peace.

The most important relations, regarding the domain of water, were with the borders and with environmental issues. Two locations were discussed:

- A small agriculture area east of the Jordan River at its confluence with the Yarmouk River, called the Baqura, was under Israeli control and cultivated by Israeli farmers, and was claimed by Jordan;
- And in the southern Araba/Arava Valley, Jordan claimed sovereignty over a stretch where it stated that Israel had moved the boarder eastward (Israel had drilled fourteen wells in this area, and used their water to irrigate crops).

In the Baqura area Israel was interested in maintaining the use of the land by its farmers. In the Araba/Arava Valley Israel wished to continue to use the water from these wells, and to be allowed to extract further quantities from groundwater. The agreement returned these two areas to Jordanian sovereignty, but allowed Israel the cultivation of the Baqura area for a period of twenty-five years, with a possibility of requesting an extension, while in the south the border was moved westward and the agreement enabled Israel to continue using the wells that are now in Jordan and “may increase the abstraction rates from wells and systems in Jordan by up to 10 Mm³/yr”. In the north, Israel agreed to give Jordan an annual quantity of 10 Mm³/yr from the desalination of saline springs. Until this was done, Israel would provide Jordan with this 10 Mm³/yr from the Jordan River.

Jordan got back the lands it claimed while Israel maintained the right to use the land (in the north) or the water (in the south).

The water agreement specifies that both sides shall prohibit the disposal of municipal and industrial wastewater into the courses of the Yarmouk River or the Jordan River before they are treated to standards allowing their unrestricted agriculture use (appendices 3, annex 2).

6.7 Creative Outcomes

As previously mentioned, there was little room for any unilateral development without impacting on other riparian states. The issue was an equitable allocation of the annual flow of the Jordan watershed between its riparian states; Israel, Jordan, Lebanon, and Syria. Egypt also was included, given its pre-eminence in the Arab world. Since water was (and still) deeply related to other contentious issues of land, refugees, and political sovereignty, the negotiations took on vital importance to relations between these new neighbours.

The technical committees from both sides accepted the Unified Plan, and the Israeli Cabinet approved it without vote in July 1955. President Nasser of Egypt, at first, became an active advocate because Johnston’s proposals seemed to deal with the Arab-Israeli conflict and the Palestinian problem simultaneously. Among other proposals, Johnston recommended the diversion of Nile water to the western Sinai Desert to resettle two million Palestinian refugees.

The plan called for water allocations to be determined in proportion to the amount of irrigable land each state had within the basin, and then allowed each

country to do what it wished with its water, including out-of-basin transfers. The development plan was created without regard to political borders, guaranteeing a degree of objectivity and engineering efficiency. The plan incorporated issues of hydrologic variability. For example, Israel was to receive the “residue” after Arab withdrawals, sometimes more, sometimes less from the average flow.

Jordan/Yarmouk, shared aquifers (Israel, Jordan 10/26/1994): Treaty of peace between the State of Israel and the Hashemite Kingdom of Jordan: Allocations of Yarmouk and Jordan Rivers based on Johnston accord; agreed in conjunction with joint development projects. Water from shared aquifers allocated on basis of prior use. “Rightful allocations” divide waters on the basis of historic rights plus future projects. Creative management: land and water historically used by Israel leased from Jordan; in the absence of storage facility, Yarmouk water “loaned” to Israel in summer, returned to Jordan from Jordan River during winter.

The idea for a Red/Dead Sea Canal has been revived once again. At the Johannesburg Summit on Sustainable Development, Israeli and Jordanian ministers announced plans for a canal to save the Dead Sea. Called a “Peace Conduit”, the proposed pipeline is expected to pump some 1.8 billion cubic meters of water per year from the Red Sea near Eilat and Aqaba to the Dead Sea, a distance of 190 km. The potential advantages, according to the Ministry for Regional Cooperation, are to raise the water level of the Dead Sea while promoting regional cooperation, water supply to Jordan through desalination, and tourism development.

It is widely agreed that the Dead Sea is one of Israel’s most important resources, a foremost industrial base and a top-priority tourist site, both nationally and internationally.

Part IV *Possibility for Co-operation*

7 General Conflict Management; Different Perspectives

7.1 Introduction

The issue of water resources availability and the potential for further development of advanced systems to provide adequate supply is not merely an academic or technological question, it also has political implications.

Regional politics can worsen the task of understanding and managing complex natural systems, and disparities between riparian states, such as level of economic development, infrastructural capacity, political orientation or cultural values, can complicate the development of joint management structures.

For conflict resolving, one needs to know the factors influencing the conflict dynamic. These influencing factors may not always be the same as the root causes of the conflict. A conflict over access to resources, for example, may develop into a conflict along ethnic lines. Over time the ethnic factor may become more important than the original cause of the conflict. Ethnicity would be termed an influencing factor. Influencing factors can affect the outcome of a conflict without influencing the initiation of the conflict. (This will be further discussed in sub-section 8.5)

General conflict management can be divided into military (e.g. peace enforcement, peace-keeping) and non-military conflict management, which in its turn can be divided into two broad areas: those dealing with legal and institutional frameworks and structural causes, and those involving co-operative negotiations and interactive conflict management. (Fisher, 2001)

After a brief explanation on what is considered as conflict prevention and the best way/s of managing disagreements, the following highlights personal comments, opinions and discussions based on meetings and general discussions with key figures during visits to Lebanon between 2006 and 2008, especially after the armed conflict that took place on July 2006 between Israel and Lebanon. Sub-section 7.3 focuses mainly on two points of view, which are considered the most significant

indicators toward finding common understanding or common ground between parties in conflict.

7.2 Conflict prevention and better understanding of disagreements

The conflict prevention and co-operation process starts with the potential for conflict or co-operation. This potential is determined by the hydrological, institutional, socio-political, and economic context.

Co-operation usually takes the form of an agreement, this agreement can be implicit or explicit, written or unwritten, and legally binding or not. Examples include formal treaties, private law contracts, customary law, shared understandings, and even a shared culture and cultural practices.

Most agreements need to be implemented and this process may change the context, and thereby create a new potential for conflict or co-operation, and start a new cycle. The process can also take a different course. Sometimes the potential for conflict and cooperation does not result in an agreement, but in an escalating conflict. Furthermore, sometimes an agreement is reached but not implemented. This can necessitate the negotiation of a new agreement, but it can also result in an escalating conflict. Finally, agreements can also be reached if there is an actual conflict and not just a potential, as many peace treaties have shown. Conflicts can de-escalate as well as escalate.

To understand the conflict resolution and prevention and co-operation, one first needs to understand the major management issues, the players involved, and the freshwater resource. This requires a basic understanding of different kind of contexts in relation to different aspects that may be important in specific cases.

- *Hydrological context*: Precipitation, evaporation, discharge, recharge, abstractions, water pollution, actual water quality, and the water quality needed for different uses and ecosystems, morphological aspects such as erosion and sedimentation, hydropower potential, and so on;

- *Socioeconomic context*: Uses and users of the freshwater resource, in-stream uses, economic circumstances of the different users, social position, degree of organization and power, regional and other disparities, need and potential for economic development, the different national cultures, and the like;

- *Institutional context*: National and international water managers and commissions, decision-making rules, existing operational rules, water use and provision rules;

- *Political context*: National, sub-national, and international political dynamics, international relations and mutual trust or mistrust, power, and similar factors.

These contexts are not stable. Conflicts and cooperation can lead to changes in the hydrology, to new infrastructure, more or less water abstraction and water pollution, more or less poverty, worse or better international relations, and so on.

Consequently, the context should not be analysed only at the beginning of the process; its evolution should be monitored. Information on the context is often scarce and difficult to obtain and the reliability of the information is often low or unknown (ibid. 2001). Many abstractions and emissions are not registered, water quality is often not monitored or the results are kept confidential, groundwater data are often lacking, and so on. Besides, the data can often be interpreted in different ways. Accordingly, the objective facts of the case are often very controversial. Uncovering such controversies is part of understanding the context. Furthermore, the context can include issues that have nothing to do with freshwater management if these issues involve the same or partially the same parties.

The analysis of the context should make it possible to identify the main issues and players and the potential for conflict and cooperation. It should be possible to characterize the main issues as collective problems, positive externalities, or negative externality problems. As mentioned previously, the cooperation potential is highest in the case of collective problems and conflict potential is highest in the case of negative externality problems. Yet one should also pay attention to subjective perceptions and to relational aspects, including the degree of trust or mistrust and the balance of power.

Growing pressure due to increasing demand for water can be a source of conflict, as mentioned previously. When water is scarce, competition for limited supplies can lead nations to see water as a matter of national or regional security. History provides ample evidence of competition and disputes over shared fresh water resources. Existing international water law may be unable to handle the strains of ongoing and future problems. But some mechanisms for reducing the risks of such conflicts do in fact exist.

Some of the most vociferous enemies around the world have negotiated water agreements or are in the process of doing so, and the institutions they have created frequently prove to be resilient over time and during periods of otherwise strained relations. Secret talks have been held between Israel and Jordan since the unsuccessful Johnston negotiations of 1953/55, even as these riparian states were in a legal state of war. (For more details see section 6.3)

7.3 Common Destiny and Living Together

By a personal initiative of the Pope, on June 12, 1991, his Holiness John Paul II announced in the presence of the four Catholic Patriarchs of Lebanon (the Maronite, the Melkite or Greek Catholic, the Armenian Catholic and the Syrian Catholic) the call to convene a Synod of Bishops for Lebanon.

The Synod's work led to the Apostolic Exhortation (incitement) and the drafting of 46 proposals and other documents for discussion, and it consists of six chapters. The Synod culminated in the Pope's visit to Lebanon on May 10 and 11, 1997, where the Apostolic Exhortation was signed and presented to the Lebanese people and their ecclesiastical and civil authorities.

The Apostolic Exhortation defines Lebanon:

Lebanon is a vital element for Catholic existence in the Middle East because "the destiny of the Catholics is profoundly bound to Lebanon's destiny and its particular mission".

Lebanon's human capacity is composed of several communities, which are "at the same time its fortune and its uniqueness".

The cultural value of Lebanon lies in being "the cradle (birth place) of an ancient culture and one of the Mediterranean's beacons." Furthermore, "no one could ignore the name of Byblos, which reminds us of the origins of the alphabet". In his address to the Patriarchs and Bishops of the Catholic Church on May 1, 1984, the Pope affirmed that Lebanon has a "valuable cultural worth" and that Lebanon is "more than a country: Lebanon is a message and an example for the East as well as for the West." His Holiness considers that "Lebanon's historical message" is a "message of freedom," of democracy, and that it is "a land of dialogue and conviviality among diverse religions and cultures".

His Holiness, during the opening of the Synod, said: "Lebanon, this small country, is larger than its size in what it represents in terms of values. Lebanon is grand in its history, comprehensiveness, esteem and message".

The Pope called in his Exhortation for a true dialogue which respects the sensibility of individuals and various communities. He further noted that the Muslim-Christian dialogue aims in the first place at promoting living together between Christians and Muslims in a spirit of openness and collaboration, which is essential for each person in order to prosper and determine choices dictated by conscience. The Pope linked the essential conditions for a true dialogue to the acceptance of the concept of pluralism. With this, the Pontiff acknowledges that affirming pluralism is the door to all solutions and without which solutions remain unattainable.

The Catholic Church sees the Islamic-Christian living together as divine will in the sense of being neighborly, cohabiting, interacting with people. Many Lebanese endure living together as a fact and as their inevitable destiny, they believe they cannot escape it, if they truly want to live on this land and bequeath it to their children and their descendants. They are aware, however, that their interest lies in more effectively and harmoniously assuming the responsibilities of living together. It is only in this way that the insistent request of the Pope to transform 'living together' or 'co-existence' into 'conviviality' can become a reality.

The Exhortation is aware that real 'conviviality' requires the existence of suitable circumstances, conditions, systems, regulations, and institutions, without which it cannot exist. Once these requirements materialize, 'conviviality' can take shape.

In the Exhortation, His Holiness lists the five most important conditions for 'conviviality' to be realized: fidelity to cultural pluralism, rejection of secularization, true dialogue, common destiny and a just social and political system.

7.3.1 National Decision Makers and Key Figures Points of View

During the July 2006 conflict between Israel and Lebanon (Hezbollah), and when asked by a Wall Street Journal's correspondent to the Middle East, General Michel Aoun responded:

"No matter how much longer this fight goes on, the truth is that political negotiations will be the endgame. ***The solution that will present itself a week, a month or a year from now will be, in essence, the same solution as the one available today, and which, tragically, was available before a single shot was***

fired or a single child was killed. Given this reality, a more concerted effort is required sooner rather than later to stop the death and destruction on both sides of the border.

For some, analysis as to this conflict's sources and resolutions begins and ends with the right to self-defence; for others, Israel's claimed self-defensive actions are perceived as barbaric and offensive acts aimed at destroying a country and liquidating a people. Likewise, some view Hezbollah's capture of two Israeli soldiers as fair military game to pressure Israel to repatriate Lebanese prisoners; yet others perceive it as a terrorist act aimed at undermining Israel's sovereignty and security.

These divergences and the world's failure to adopt different paradigms by which Middle East problems can be fairly analysed and solved have produced, and will continue to produce, a vicious cycle of continuing conflict. ***If the approach remains the same in the current conflict, I anticipate that the result will be the same.*** This, therefore, is a mandate to change the basis upon which problems are judged and measured from the present dead-end cycle to one which is based on universal, unarguable principles and which has at least a chance to produce a lasting positive result.”

“My own personal belief is that all human life is equal and priceless -- I look upon Israeli life as the same as Lebanese life. This belief stems not from my Catholic religion, but rather, from basic human values which have their historic home in Lebanon. It is no coincidence that a leading figure in the drafting and adoption of the Universal Declaration of Human Rights was Charles Malek, a Lebanese citizen.

I ask, will other Arab countries and leaders have the courage to acknowledge that Israeli life is equal to Arab life? Will Israel have the courage as well to acknowledge that Lebanese life is equal to Israeli life, and that all life is priceless? I believe that most Israeli and Arab citizens would answer in the affirmative. Can we get their governments and their leaders to do the same?

Acknowledgement of equality between the value of the Lebanese and the Israeli people can be a starting point and a catalyst. The universal, unarguable concept of the equality of peoples and of human life should be the basis upon which we measure and judge events, and should provide the common human prism through which the current conflict and old seemingly protracted conflicts, are viewed and resolved. This is the only way to peace, prosperity and security, which is, after all, what all human beings desire, regardless of their origin.

The ideological, political and religious differences between the party that I lead, the Free Patriotic Movement, and Hezbollah, could have been addressed either through confrontation, or through internal dialogue. Recognizing the value of human life, the obvious choice was the second option. We sat down with Hezbollah to discuss our differences.

After many months of extensive negotiations, we came up with an understanding that included 10 key items (see appendix 5, annex 2), which laid down a roadmap to resolve 10 of the most contentious points of disagreement. For example, Hezbollah agreed for the first time that Lebanese who collaborated with Israel during Israel's occupation of south Lebanon should return peacefully to Lebanon without fear of retribution. We also agreed to work together to achieve a civil society to replace the present confessional system which distributes power on the basis of religious affiliation. Additionally, Hezbollah, which is accused of being staunchly pro-Syrian, agreed for the first time that the border between Lebanon and Syria should be finally delineated, and that diplomatic relations between the two countries should be established.”

Furthermore, he added: “This is the essence of the comprehensive solution we seek. Because it embodies a shift from a policy based on military force to one founded upon human values and reconciling the rights of parties, it would stand the test of time. If rights are respected, and if parties are treated with the deference that they implicitly deserve as human beings, and then the long-term result will be not only physical disarmament but also a disarmament of minds on both sides.”

In an interview with the New York Times on January 21, 2007, Mr Hassan M. Fattah wrote: Last year, General Aoun approached Hezbollah’s leader, Sheik Hassan Nasrallah, and said he still intended to strip Hezbollah of its weapons, but only after the group’s main complaints with Israel and with the government were answered.

“It’s not like I love Hezbollah,” General Aoun said in an interview. “I am not trying to defend Hezbollah as much as I am trying to find a solution with them, because a clash with them would ruin us.”

That honesty, Hezbollah officials say, engendered trust in General Aoun. “It created a sense of trust between Shiites and Christians,” said Ghaleb Abu Zeinab, a member of Hezbollah’s politburo. “We don’t want to establish an Islamic republic, we

want diplomatic and normal relations with Syria, and we want a consensual democracy and so does the Free Patriotic Movement.”

Some analysts credit the alliance with helping stabilize conditions in Lebanon after the war, as well as helping to change Hezbollah’s focus from regional issues to local ones.

“It helped show Hezbollah’s real position and its understanding of Lebanon,” Mr. Abu Zeinab said. “It helped the party appear as a more Lebanese party than it used to before.”

General Michel Aoun continues:

“Great nations are those that can couple their political discourse with real application. With this in mind, we affirm that change and reform will only find its way to implementation according to the following principles and beliefs:

- We believe in democracy as a system of governance and a way-of-life, and we consider it to be the sole system that preserves the dignity of man, empowers the individual and frees his abilities, and allows him to be the master of his destiny.

- We declare that we adhere to human rights as stipulated in international charters, and to public freedoms which constitute the foundation of democracy, and ascertain that men and women are equal in terms of rights and duties, and that the woman is a partner in building society and in decision-making.

- We wish to achieve a more comprehensively humane and fair society; a society in which the concept of citizenship is given its true dimension; a society that stands in solidarity with its weak and marginalized groups; a society that does not sacrifice its youth for its elderly.

- We pledge to preserve national unity, based on true partnership and balance, as a guarantee to the survival of Lebanon as a nation and a mission.

- We emphasize modern Arabism that is open to and interacting with all cultures and to which Lebanon have contributed greatly.

- We consider that Lebanon, a land of dialogue and interaction, has a prominent role in spreading the culture of peace in its environs and in the world.

Other Key figures points of view

In a meeting during one of my visits to Lebanon on September 2008, Dr Issam Khalife, one of the well known figures who has many publications in regards to water, mentioned that no peace between Israel and Lebanon unless there is peace between Israel and its neighbours. This peace should be based on the recognition of

the right to exist of all the concerned parties. This cannot be done by dominating their natural resources, especially freshwater resources.

In another meeting with Dr Fadi G. Comair, at the Research and Development centre at Notre Dame University (NDU), on October 2008, another well known figures and activist with many publications concerning the water sector in Lebanon, he said that any peace process between Lebanon and Israel should start by the implementation of all the UN resolutions regarding the conflict in the Middle East, especially the UN Resolutions 1701 in regard to the recent conflict between Lebanon and Israel in 2006. Workshops are a must and all the groups and parties should participate in order to reach a common understanding to all the conflictive issues.

7.4 Conclusion

The Middle East is a region hassled not only by lack of water but also by political tensions. While action and co-operation among the states is necessary in fields other than water and the environment, water stands to become a vehicle which can enhance peaceful relations between the parties and may even relieve tensions in other political dimensions. Since water is vital for the survival of the entire regional population, parties may find it necessary to co-operate and costly to defect.

The socio-economic and political way of dealing with scarcity is, in many cases, the explanatory factor between scarcity and conflict/co-operation. An examination of the socio-economic/political conditions alone would fall short of assessing and understanding the situation. The culture/religious issues as well as the physical reality should be taken into consideration in choosing the area to be studied: for example a natural river basin, such as the Jordan River Basin, and not the political borders of one country.

Unstable international relations complicate the development of co-operation and can cause conflict. In some cases it is necessary to improve the relations before the water management issues can be solved, but water management issues can also trigger the development of good relations.

The purpose of showing these points of views is to say that there are ways in finding common grounds in order to achieve peace

If the hearts are transformed, so will the structures be.

If we begin to train our consciences in the direction of peace, reconciliation and concord, we can move ahead to the new future.

If we believe in our obligation to forgive and cleanse our memory, we then begin with a new spirit.

If extremism retreats and rights are granted and guaranteed to each person, then anxiety and suspicion will disappear, a new path of tranquility will be opened.

If we are prepared with humble hearts to accept the guidance of the Spirit, we can walk in the path that the Lord has laid out for us. (Najem, A. 2007)

8 *Managing Water Resources towards Co-operation*

8.1 Introduction

In part two, this thesis looked at water availability in Lebanon and Israel (chapters three and four). It then explored the gaps that exist when international law is used to resolve regional water disputes in chapter five, as well as discussing the use of available resources as efficient as possible. In the case studies, the thesis continues by examining the incompetency in the existing international water law especially when handling some mechanisms for reducing the risks of conflicts.

After highlighting the Hydro-political position and the status of the Jordan River Basin, in chapter 6, this thesis examined a couple of case studies, in which it was demonstrated that despite an existing conflict between two parties, there is a high possibility for reaching an understanding. Also this thesis, in chapter 7, introduced a few points of view from well known figures and organizations that have or can contribute in one way or the other toward long term settlement, which can open the door latter to a final resolution to the conflict.

This chapter highlights the key themes in freshwater availability and discusses the related issues concerning the conflict prevention and management of disagreements. In a later section (8.5) the focus is on the lessons learned from the case studies in chapter six, and the possibilities that could encourage cooperation, especially through an attempt to emphasize multilateral talks and common denominators. This final section of this chapter is presented as a stepping stone to another level of in-depth discussions between the relevant countries. It tries to set up a model or a *Road Map*, which can be used as another step-forward towards using water resource negotiations as a means for promoting peace and encouraging solution to the conflict.

8.2 Freshwater Availability

In summarising chapter four we can see why it is that Lebanon is considered “un Château d’Eau” compared to its neighbours. Lebanon has a wealth of water

resources in its numerous rivers, and underground aquifers, and gets plentiful rainfall in the winter. The country is made up of two principal hydrological regions:

- The Mediterranean (or coastal) watershed, with an area of 5,500 km², which gives rise to 12 perennial rivers from the western slopes of the mountain ranges, flowing from east to west and emptying into the sea; and
- The interior watershed, with an area of 4,700 km², which is the source of the Litani, Assi (Orontes), and Hasbani rivers. (Appendix 2, Annex 1, Map 2)

The country may be divided further into some 40 drainage basins of permanent or intermittent streams, whose flows depend on the topography of the watershed and the size of the mountain reservoirs that their sources feed.

About 90% of all precipitation is received between November and April. January is the wettest month, and snow is frequently present in areas higher than 1,500 m above sea level. Precipitation varies spatially, as well as temporally. Precipitation in the highlands averages 1,500 mm/year, and the mountain peaks along the western ranges receive about 2,000 mm. Annual average precipitation in the northern Bekaa region, near Hirmil, is 250 mm; in Ba'albeck, 550 mm; and in Karoun and Marjoun, 700 mm. Yearly precipitation along the coast is 830 mm in the north, 800 mm around Beirut, and 700 mm in and around Sur (Tyre) in the south.

Lebanon is in a relatively good hydrological position. It is estimated that the total yearly precipitation results in an average yearly flow of 8,600 million cubic meter (Mm³), giving rise to 40 major streams and rivers (including 17 perennial rivers) and more than 2,000 springs. Multiple studies confirm that the fundamental problem is that more than half of the rainwater flows unexploited into the sea, accompanied by poor water management (for more details see section 4.2).

On the other hand, Israel is an arid country, with the desert occupying more than 50% of its land area. Similar conditions exist in other countries in the region. Israel has a surface area of about 20,770 km² and a population of about 6.3 million. Annual rainfall ranges from nearly 1,000 mm in the north to 30 mm in the south, and nearly all of it falls within the four-month period from November through February, with quantities fluctuating from year to year.

Annual water availability in Israel is estimated at approximately 2,000 Mm³ per year, of which about 1,600 Mm³ is potable water and the rest is brackish and other marginal water sources. Both water resource development and consumption have grown rapidly since the establishment of the State of Israel in 1948. The depletion of

the country's main water sources is worsened by the deteriorating quality of water resources due to demographic, industrial and agricultural pressures and to overexploitation of the country's water reservoirs beyond the natural replenishment rate.

Israel's water demand and consumption are increasing, exceeding the capacity of the natural sources, which are being depleted. Water quality in the sources is deteriorating, due to over-exploitation and intensive human activity. In 1997, the quantity stored in reservoirs was 1,000 Mm³ compared to the average supply of 1,800 Mm³ within the "green line" boundaries (1967 borders) and 2,100 Mm³ between the Jordan River and the Mediterranean (for more details see sub-section 3.2).

It is important to take into account that the aquifers in the Palestinian territories, and particularly the mountain aquifer, are the fourth major source of water-related disputes in the Middle East. The Palestinians claim the right to use this water by virtue of their sovereignty over the territories. Israelis claim that by pumping water that would naturally emerge in Israel and that has historically been extracted there (even before the creation of the state of Israel in 1948); they are simply taking what is theirs. The issue in this matter has two faces. One is the slow destruction of the coastal aquifer owing to salt water intrusion caused by over-pumping. Second, the areas in the mountain aquifer from which water can most efficiently be pumped are near to the Green Line separating the Israelis from the Palestinians.

Today, all feasible resources are exploited, including springs, groundwater reservoirs, aquifers and the Jordan River system. At the same time, as a result of accelerated population, industrial and agricultural growth, the coastal aquifer has been increasingly threatened by contamination from chemical and microbial pollutants, salinity, nitrates, heavy metals, fuels and toxic organic compounds.

8.3 International Laws and Regulatory Mechanisms

In chapter five we discussed the various international efforts to protect and sustain fresh water which have focused primarily on management practices and policies, rather than prevention of violence and conflict that impact water supply. Little attention has been given to the international legal regimes that are designed to protect fresh water, or the effectiveness of those regimes.

There are no internationally accepted criteria for allocating shared water resources, or their benefits. Indeed, it is difficult to see how to develop guidelines for allocating a vital resource which is mobile, which fluctuates in time and in space, and which ignores political boundaries.

International law has not been clear on the shared watercourses, rivers or cross border aquifers. The methods, by which an individual, a group, a legal entity or a nation can store, transfer and regulate the flow of water, are hard to comprehend.

Governments, organizations and individuals negotiate agreements using a mixture of customary use, local and tradition laws, and the established right of use over a period of time. Such mixture is often contradictory and in itself a cause of conflict.

International conflicts are difficult to resolve because no third party has the authority to enforce an agreement among national states, let alone impose one. Such international agreements as exist have to be self-enforcing. Efficient outcomes may emerge, but are not guaranteed. International law may emphasize the doctrine of equitable utilization of water resources, but there is no clear definition of what this implies.

In recent years, as concern over the equitable utilization and sustainable development of scarce water stocks has deepened, efforts to improve the management of shared water resources have expanded. The Declaration of the Earth Summit in Rio in 1992, and the accompanying Agenda 21 Action Plan, for example, called upon the international community to recognize the multi-sector nature of water resources and to manage the resource within and across national boundaries (for more details see sub-section 5.2).

The United Nations Convention on the Law of the Non-navigational Uses of International Watercourses, adopted in 1997 by the UN General Assembly following twenty-seven years of discussion and negotiations, is one post-Rio accomplishment that specifically focuses on trans-boundary water resources. It codifies many of the principles deemed essential by the international community for the management of shared water resources, such as equitable and reasonable utilization of waters with specific attention to vital human needs, protection of the aquatic environment and the promotion of cooperative management mechanisms.

The document also incorporates provisions concerning data and information exchange and mechanisms for conflict resolution. If ratified, the UN Convention

would provide a legally binding framework, at least upon its signatories, for managing international watercourses. Even without ratification, its guidelines are being increasingly invoked in international forums. The UN's approval of the Convention, however, does not entirely resolve many legal questions concerning the management of internationally shared water:

- The Convention would technically only be binding on those nations that sign and ratify it. Five years after its adoption by the UN General Assembly, the Convention has been signed only by sixteen countries and ratified by nine, well below the requisite thirty-five instruments of ratification needed to bring the Convention into force, and it therefore has no legal status;
- International law only guides conduct between sovereign nations, and cannot address the grievances of political or ethnic units within nations;
- While the Convention offers general guidance to co-riparian states, the vague and occasionally contradictory language can result in varied, and indeed conflicting, interpretations of the principles contained therein.

A fourth legal issue left unresolved by the Convention is that there is no official enforcement mechanism to back up the Convention's guidance.

Given the current state of developments, it seems there is not enough in the body of international law that can be used effectively to resolve regional water disputes. Countries mismanage their water resources, largely on agriculture, with disregard for their actions' implications for the quantity and quality of water that will be available tomorrow and almost no consideration for the impacts on their neighbours. On the other hand, when water availability becomes worse, countries are ready to do battle over their sovereign rights, heritage, and national security.

It remains clear, however, that well developed domestic water management can prevent, or at least significantly delay such crises; regional water management may postpone such crises indefinitely; and if all else fail, countries with access to the sea can evaluate the costs of desalination to obtain an upper limit on the cost of additional water supplies.

8.4 Lessons learned from the case studies in Section 6 and the possibilities towards co-operation

When formal regulatory mechanisms are absent or ineffective, communities will seek other means of translating their preferences into reality. This will be

considered as an informal regulation, which need not be limited to cases where formal regulation is absent. Saying that, informal regulation will be likely wherever formal regulation leaves a gap between actual and locally-preferred cooperation.

The use of the Jordan River creates a complex relationships, claims, and dependencies. Its four tributaries, and thus its origins, are in several nations. The Yarmouk River originates in Syria, the Banias in Israeli-occupied Syria, the Hasbani in Lebanon, and the Dan in Israel. The Jordan River itself can be claimed, at least in part, by Israel, Syria, Jordan, and the Palestinians. The intersection of so many interests and tensions amid outright political hostility among the actors creates a potential flashpoint for conflict.

Accordingly, attempts and future strategies to deal with tensions between parties should take into consideration the following: “lessons learned” section from the previous chapter, after examining the lessons learned overall, the following subsections explore the possibilities of cooperation over water based first on Religion, Culture and values, second on the rights to needs’ phenomena, and third on economical issues.

8.4.1 Lessons learned

a) In highly conflicting settings, separating resource issues from political interests may not be a productive strategy:

Eric Johnston took the approach that the processes of reaching a rational watershed management plan:

- May, itself, act as a confidence-building catalyst for increased cooperation in the political realm;
- May help alleviate the burning political issues of refugees and land rights. By approaching peace through water, however, several overriding interests remained unmet in the process. The plan finally remained unratified mainly for political reasons.

Issues of national sovereignty which were unmet during the process included: The Arab states saw a final agreement with Israel as recognition of Israel, a step they were not willing to take at the time. Some Arabs may have felt that the plan was devised by Israel for its own benefit and was put over by the US.

The plan allowed the countries to use their allotted water for whatever purpose they saw fit. The Arabs worried that if Israel used their water to irrigate the Negev (outside the Jordan Valley), that the increased amount of agriculture would

allow more food production, which would allow for increased immigration, which might encourage greater territorial desires on the part of Israel.

b) Issues of national sovereignty can manifest itself through the need for each state to control its own water source and/or storage facilities:

The Johnston Plan suggested that some winter flood waters be stored in the Sea of Galilee, which is entirely in Israeli territory. The Arab side was reluctant to relinquish too much control of the main storage facility. Likewise, Israel had the same kinds of control reservations.

c) Ignoring a riparian party, even one without political standing, can hamper agreement:

There was some concern over whether the Plan was designed to “liquidate the Palestinian refugee problem rather than to give the refugees their right of return”. In fact, Palestinians were not addressed as a separate political entity.

Along with political entities, many interests affected by river management were not included in the process. These included Non-Government Organizations (NGOs), public interest groups, and environmental groups. Perhaps as a consequence, the entire river was allocated, leaving no water at all for in-stream uses.

d) Including key non-riparian parties can be useful to reaching agreement; excluding them can be harmful:

Egypt was included in the negotiations because of its pre-eminence in the Arab world and despite its non-riparian status. Some attribute the accomplishments made during the course in part to President Nasser’s support.

In contrast, pressure after the negotiations from other Arab states not directly involved in the water conflict may have had an impact on its eventual demise. Iraq and Saudi Arabia strongly urged Lebanon, Syria and Jordan not to accept the Plan. Perhaps partially as a result, Lebanon said they would not enter any agreement that split the waters of the Hasbani River or any other river.

e) All of the water resources in the basin ought to be included in the planning process. Ignoring the relationship between quality and quantity, and between surface and groundwater, ignores hydrologic reality. Groundwater was not explicitly dealt with in the Plan, and is currently the most pressing issue between Israel and the Palestinians. Likewise, tensions have flared over the years between Israel and

Jordan over Israel's diverting saline springs into the lower Jordan, increasing the salinity of water on which Jordanian farmers rely.

f) Even in the absence of an explicit arrangement, some degree of implicit cooperation may be possible, perhaps leading to fairly high stability. While the lack of ratified agreement left a legacy of unilateral and generally sub-optimum water development in the basin, the implicit arrangement, which resulted, particularly between Israel and Jordan, decreased tensions and added certain stability between these most riparians. The "Picnic Table" talks have allowed a venue for some level of technical understanding, and an outlet for minor disputes, for more than forty years.

Overall, allocations were based on irrigable land within the basin; then each could do what it wishes with water. Each tributary had one state without designated flow, to accommodate fluctuating supply. Accord was never ratified for political reasons.

Despite the forward momentum, the Arab League Council decided not to accept the plan in 1955 (Appendices 3, Annex 3) because of the political implications of accepting, the momentum died out. Although the agreement was never ratified, both sides have generally adhered to the technical details and allocations even while proceeding with unilateral development. The agreement was encouraged by the United States, which promised funding for future water development projects only as long as the Johnston Plans allocations were adhered to.

8.4.2 Conflict or Cooperation

The likelihood of conflict will be at its minimum and the difficulties surrounding a water management issue more manageable while there are viable options. This is especially true for water projects in regions where pumping today from underground aquifers, both replenish and especially non-replenish ones will have a major impact on tomorrow's water availability. These options can be explored in three areas.

1) Religions, Culture and Values

For any negotiation, towards cooperative agreement or discussions between relevant parties, the following points of view suggest there are many common values that exist:

- When asked: When a dark moonless night ends? A Rabbi answered:

"When looking at the coming person's face we see either one of our brothers or one of our sisters."

- Prophet Mohammad (PBUH) once said:

“One should live in the world not like a permanent resident but like a traveller, and should never forget that he will die!”

- When asked: Who he had learned his virtues from? Jesus responded:

“I did not learn them from anyone. I looked at others, observed the things I did not like and I avoided doing the same, copying and imitating the things I liked.”

Most scientists and even development professionals avoid examining religion or values in the context of their work to avoid discord and to keep discussions “objective.” However, where science, development, and values intersect, the issue cannot be avoided.

Many value systems have their origins in religion. Recognizing the role of religion can therefore enrich our understanding of how individual and collective choices are made, independently of our own belief in, or attitude towards religion in general, or towards a particular religion. Examining values is not easy; it can be particularly sensitive especially in the Middle East, where the prevailing religion is Islam, but which also has many adherents of other faiths, such as Christianity and Judaism.

The values need not always be infinite in importance. Sometimes the compensation variation will be infinite because the parties do not like the idea of paying cash for certain values, or do not like the idea of trading those values through a more complicated form of barter. In some cases the value itself is incompatible with the idea of trade, i.e. a bought respect is no respect at all, and the gains from trade model will fail in cases of this kind.

Conflicts between groups are often not solved but suppressed and may result in an armed struggle, at least when the cultures concerned are also uncertainty averse. Uncertainty averse means that members of these cultures feel threatened by uncertain or unfamiliar situations (as in the case of Israel and the Arab countries).

Several strategies must be taken into consideration to overcome conflicting interests, the most common and effective one is to develop and maintain good relations and to compromise on the basis of reciprocity on points that are important between countries. In the long run such a strategy should benefit all parties concerned.

Most concepts of culture generally can be misused. Culture may be used to label people or be used as an excuse for failing negotiations. If the concept is not

specified, it can be misused to explain everything that cannot be explained otherwise.

The cultural values of humans affect the way the natural environment and resources are comprehended, used, and managed. Water management principles that listen to the local cultural-religious context and understanding are likely to be more effective than abroad ones.

Complications can occur when the parties come from different cultures. Culture influences the perceptions of the parties and the values to which they are bound to, so different cultures can mean different values. Misunderstandings can occur easily when the same actions and words may have different meanings. Problems may also occur if one party sees the other party, whether correctly or not, as culturally arrogant and dominant.

Relations can improve if one of the parties shows an interest in the culture of the other and common cultural elements are discovered. Whenever there are large cultural differences, it may be useful to have experienced diplomats undertake the negotiations rather than high government officials with little international experience. One could also use a mediator as a kind of “cultural interpreter”.

As an example: In 1997 discussions among the riparians of the Euphrates basin, the Syrians objected strongly the proposals for water pricing. This led to a temporary impasse until it was explained by an outside observer that some Islamic legal interpretation forbids charging money for water itself. The term was modified to “tariff”, to represent costs only for storage, treatment, and delivery, and discussions were able to proceed (sub-section 5.2).

Parties to war and conflict are unlikely to have a realistic assessment of one's prospects and abilities. For instance, people tend to have especially stubborn and irrational opinions in the areas of religion and politics. Large number of them thinks they are the world's best judges of truth in this area, but few have comparable opinions about their relative expertise in building bridges.

The general tendency is to think that what benefits one's interest also benefits the world at large. However two parties may find it hard to agree, if they do not share the same positive vision of how the world works. On top of those problems, the minority that does not want peace at all takes actions to exacerbate adverse behavioural and psychological reactions (i.e. terrorism as an attempt to manipulate such behavioural weaknesses).

There are other reasons why users of a communally managed or owned resource will fail to come to an agreement on managing the resource even though it is in the interest of all users to cooperate and reduce their rates of use of the resource. One reason is that if this improved situation is attained, every user will earn even higher returns by free-riding. Thus cooperative agreements, even if they are reached, will not persist. The only way out of the common property dilemma is intervention by a third party. Because national sovereignty must be respected, the only way out of this dilemma is agreement. Yet, there are strong incentives for governments not to cooperate, or to defect from an agreement.

2) Rights to Needs

Many of the negotiations begin with parties basing their initial positions in terms of rights, the sense that a riparian is entitled to a certain allocation based on hydrography or chronology of use. Up-stream riparians often invoke some variation of the Harmon Doctrine, claiming that water rights originate where the water falls, as did France in the Lac Lanoux case and the Palestinians over the West Bank aquifer. Down-stream riparians often claim absolute river integrity, claiming rights to an undisturbed system or historic rights based on their history of use. (Chapter 5, sub-section 5.2.3)

The paradigms used for negotiations have not always been rights-based, however, neither on relative hydrography nor chronology of use, but rather needs-based. Needs are defined by irrigable land, population, or the requirements of a specific project. This then leads to distinguishing between rights in terms of a sense of entitlement, and legal rights. Once negotiations lead to allocations, regardless of how they are determined, each riparian has legal rights to that water; even if the allocations were determined by needs.

Along the Jordan River, the only water agreement for that basin ever negotiated, the Johnston Accord (sub-section 6.3) emphasized the needs rather than the inherent rights of each of the riparians. Johnston's approach, based on a report prepared under the direction of the Tennessee Valley Authority, was to estimate, without regard to political boundaries, the water needs for all irrigable land within the Jordan Valley basin which could be irrigated by gravity flow. National allocations were then based on these in-basin agricultural needs, with the understanding that each country could then use the water as it wished including diverting it out-of-basin.

This was not only an acceptable formula to the parties at the time, but it allowed for a break-through in negotiations when a land survey of Jordan concluded that its future water needs were lower than previously thought. Years later, Israel and the Palestinians came back to the needs in the Interim Agreement of 1995, where Israel first recognized Palestinian water rights in the West Bank.

The law of international water resources offers two extreme rules that are related to property rights. The doctrine of unlimited territorial sovereignty or the doctrine of absolute sovereignty stipulates that a country has exclusive rights to the use of water within its territory. This means that a country may pollute its river as much as it wants. This principle, referred to as the Harmon Doctrine for the US attorney-general who suggested this stance in 1895 regarding a dispute with Mexico over the Rio Grande, argues that a state has absolute rights to water flowing through its territory. (Section 5.2)

This doctrine was immediately rejected by Harmon's successor and later officially repudiated by the US: it was never implemented in any water treaty; it was not used as a source for judgment in any international water legal ruling; and it was rejected by the international tribunal over the Lac Lanoux case in 1957 (Appendix 1, Annex 4).

In contrast, the doctrine of unlimited territorial integrity or the doctrine of limited territorial sovereignty states that the quantity and quality of water available to a country cannot be altered by another country. This rule implies that the upstream country cannot pollute the shared river. This principle has reached acceptance in the international setting as rarely as absolute sovereignty. (Chapter 5, section 5.2)

In an arid watershed, the down-stream riparian often has older water infrastructure, which is in its interest to defend. The principle that rights are acquired through older use is referred to as historic rights (or prior appropriations in the US), that is, first in time, first in right.

The doctrine of unlimited territorial integrity reflects rights to reasonably use the waters of an international waterway, yet with the acknowledgment that one should not cause harm to any other riparian state. This is a concern, which is raised regularly in negotiations, recently between Egypt and Ethiopia, and for a series of proposed canals from Turkey or Lebanon into the Jordan basin. It is primarily this concern, which causes Israel to emphasize desalination over possibly less-expensive water import schemes.

Needs-based allocations have been advocated in recent disputes, especially in and around the Jordan River watershed where riparian disputes exist not only along the river itself, but also over several shared groundwater aquifers. Gleick (1993) defines basic human needs, regardless of climate, as 50 litres per capita per day for personal use alone (18.25 m³/yr.) and, in earlier work Gleick suggests 75 M³/yr, as appropriate minimum levels per capita for the Middle East.

Shuval (1992) also argues for a minimum baseline allocation between Israel, West Bank Palestinians, and Jordan, based on a per capita allotment of 100 M³/yr for domestic and industrial use plus 25 M³/yr for agriculture. He adds 65% of urban uses for recycled wastewater, and advocates a series of water import schemes and desalination plants to provide the difference between regional supply and future demand.

Wolf (1995) likewise advocates a needs-based approach, but considers new sources such as recycled wastewater as separate issues. He plans for total urban needs of 100 M³/yr per person, and extrapolates to the point in the future where all of the basin's 2,500 Mm³/yr. has to be allocated first to these needs, in other words when the regional population reaches 25 million, expected in the early part of this century.

Negotiations move from rights-based to needs-based criteria for allocation because:

a) In part, this reflects the typical psychology of negotiations. Rothman (1995), among others, points out those negotiations ideally move along three stages:

- The adversarial stage, where each side defines its positions, or rights;
- The reflexive stage, where the needs of each side bringing them to their positions is addressed;
- And finally, the integrative stage, where negotiators brainstorm together to address each side's underlying interests.

The negotiations here seem to follow this pattern from rights to needs and, occasionally, to interests. Where each negotiator may initially see himself, or herself as Egyptian or Israeli or Indian, where the rights of one's own country are paramount, over time one must empathize to some degree to notice that even one's enemy, be he or she Sudanese, Palestinian, or Pakistani, requires the same amount of water for the same use with the same methods as oneself.

b) Rights are not quantifiable and needs are. We have seen in Section 2 the vague guidance that the 1997 Convention provide for allocations, a series of occasionally conflicting parameters, which are to be considered as a whole. If two nations insist on their respective rights of upstream versus down, for example, there is no spectrum along which to bargain, no common frame of reference. One can much more readily determine a needs-based criterion (irrigable land or population, for example) and quantify each nation's needs. Even with differing interpretations, once both sides feel comfortable that their minimum quantitative needs are being met, talks eventually turn to straightforward bargaining over numbers along a common spectrum.

3) Economic measures encouraging cooperation

Before water problems become serious, they are more likely to be seen as economic rather than political; thus, the earlier potential water disputes are addressed, the more likely it is that they will be resolved efficiently and peacefully. The use of optimizing models and the exchange of water permits can greatly assist in such resolution.

Disputes over water among different users are most commonly considered to be zero-sum games (one party's gain is another's loss). Such a view of water allocation can lead only to conflict. But by considering water as an economic good, countries and regions can manage water optimally and differences can be resolved before they lead to conflict.

As is true of any economic good, water is scarce; but, unfortunately, competitive markets cannot be relied upon to allocate water efficiently. Water markets are usually not competitive, because there are few sources of water and few sellers, and the social and private costs of obtaining and distributing water and the social and private benefits from using it do not coincide.

The allocation of water resources according to its economic value is considered as one of the most important principles involved into water conflict resolution. Here we distinguish between the allocations of water to its highest value use "Efficiency" and the distribution of gains from allocation "Equity" (for more details see section 5.2).

Allocations always reflect political considerations, together with economic realities. Allocation of water based on economic considerations tends to promote efficiency in both the production and consumption of water, as well as increasing the

efficacy of major new water project investments, but other modes of allocation do not. In Israel for example, economic considerations long played a secondary role, thereby exacerbating the scarcity problem.

Are efficient allocations equitable? Economists disagree about how to define equity and how to quantify it. As a result, no agreement on whether one efficient allocation is preferred to another is attainable. One inefficient allocation of resources may be more equitable than another efficient allocation.

Negotiated outcomes need not maximize net benefits for all countries. Inefficiencies can be traced to the desire to nationalize resources rather than to gain from cooperative development. Both efficiency and equity should be considered in agreements for managing international water resources (for more details see section 5.2).

The basic economic problem that underlies all economic issues is the combined existence of scarce resources and unlimited wants. Given that, the first question is how to use scarce resources and organize production so as to satisfy to the greatest extent possible, society's unlimited wants? In other words, the available resources must be used as efficiently as possible, meaning that the maximum output must be obtained from the resources in hand (for more details see section 5.2).

The Coase Theorem suggests that war should be unlikely, rather than fighting the two sides could achieve some mutually advantageous bargain. They could live at peace with a higher standard of living, or in case of conflict one side, the weaker, should surrender rather than fight (for more details see section 5.2).

The following discussion of the optimization model is based on, and borrows heavily from Fisher M. Franklin (2002), and, as regards to water in the wider Middle East context, we refer to Hussein Askari and Catherine Brown (2001) and Askari Hussein (2001) alone, allocating water so as to maximize the net benefits to all consumers, subject to constraints. When such maximization of benefits involves one or more constraints, a system of "shadow values" is involved in the solution.

The "shadow value" of water at a particular location shows the increase in system-wide benefits that would occur if an additional cubic meter of water were available at that location. The "shadow value" associated with a particular constraint shows the extent to which the net benefits from water usage would increase if that constraint were relaxed. For example, where a pipeline's capacity is limited, the associated shadow value shows how much benefits would increase if capacity were

slightly increased; this is the amount that those benefiting would be willing to pay for such an increase in capacity.

The shadow value of water in a given location does not generally equal the direct cost of providing it there. In other words, let us consider a limited water source whose pumping costs are zero. If demand for water from that source is sufficiently high, the shadow value of that water will not be zero; benefits to water users would be increased if more water were available from that source.

When demand at the source exceeds capacity, it is not costless to provide a particular user with an additional unit of water. That water can be provided only by depriving some other user of the benefits of the water, that loss of benefits represents an opportunity cost. In other words, an entity that owns its water resources and uses them itself incurs an opportunity cost equal to the amount of money it could otherwise have earned through selling the water.

Accordingly, scarce resources have positive values and positive prices even if their direct cost of production is zero. Such a positive value, the shadow value of the water in site (where it is found), is called a scarcity rent. The general results are as follows:

- The shadow value of water used in any location equals the direct marginal cost of production plus the scarcity rent;
- Water will be produced at a given location only if the shadow value of water at that location exceeds the marginal cost of production;
- If water can be transported from one location to another, then the shadow value of water at the second location can never exceed the shadow value at the first location by more than the cost of transportation;
- An activity should be increased if it is profitable at the margin using shadow values; an activity that loses money at the margin using these values should be decreased.

The WAS model can be applied to districts within a country or to two or more countries that have interdependent water supplies, water demands, water costs, and related water infrastructures. The geographical region under management is divided into a number of districts. Within each district, demand curves for water are defined for household use, industrial use, and agricultural use. The annual renewable amount of water from each source is taken into account, as is the pumping cost. Allowance is made for recycling of wastewater and inter-district conveyance.

Environmental issues are handled in several ways:

- First, water extraction is restricted to annual renewable amounts;
- Second, an effluent charge can be imposed on households and industry;
- And, third, the use of recycled water in agriculture (as opposed to other, competing uses) can be restricted.

The model permits experimentation with different assumptions about the infrastructure that will be in place in the future, such as the creation of seawater desalination plants in any district that has a seacoast.

The analyst specifies the national and regional policies toward water that are desired. The model does not make water policy. The analyst imposes his or her values or policies on the model, which then respects them absolutely. The WAS model provides the analyst with the means to examine how his or her policies can be efficiently implemented and what the consequences would be.

The WAS model allocates the available water so as to maximize net benefits, providing the analyst with optimal water allocations and shadow values. Among other things, the model is a powerful tool for analyzing the costs and benefits of various infrastructure projects.

Separate models of this kind have now been built for Israel, Jordan, and the Palestinians National Authority (PNA) to help them study aspects of a variety of projects, including the following:

- A cost-benefit analysis of the infrastructure that would be required to bring additional water to Israel from the Litani River in Lebanon (assuming full peace and Lebanese agreement to sell water to Israel);
- A cost-benefit analysis of reducing leakage in the water system of Amman;
- The relationships among desalination at Gaza, a pipeline between Gaza and the West Bank, and the amount of water owned by the Palestinians.

Beyond such uses for more efficient water management, however, WAS models could be used to assist in water negotiations and to foster cooperation by creating win-win situations.

These uses can be briefly described as follows:

- Because the use of a WAS model reveals the value of water in different locations, it enables water disputes to be expressed in monetary terms, which should facilitate their resolution. This is particularly so because the availability of seawater desalination puts a ceiling on the value of water to any country

that has a seacoast. For Israel, Jordan, and the PNA, that ceiling is not very high, and the results obtained with the model show that the value of disputed water is very low indeed, so that the disputes involved are not nearly as economically important as they appear.

- Each negotiating party can use its WAS model to evaluate the consequences to itself of different proposed water agreements and to estimate the consequences for others.
- Perhaps most important, the use of a regional WAS model shows that cooperation in managing shared water sources can be very beneficial. That cooperation can involve the trading of water permits, short-term permits to use another party's water at specified locations. Such trading would take place at the shadow values given by the WAS model's output and would lead to joint gains wherever the parties valued water differently. Further gains are possible from the construction of joint infrastructure. While property rights ultimately have to be established, the WAS-type approach clearly shows that such disputes are merely matters of money and should be seen as such. As a result, a WAS-type solution can be used without waiting for a resolution of disputed property rights, because payments can be placed in a written agreement fund while countries continue to negotiate. For Israel and the PNA, the gains from cooperation appear far greater than the value of ownership of disputed water resources.

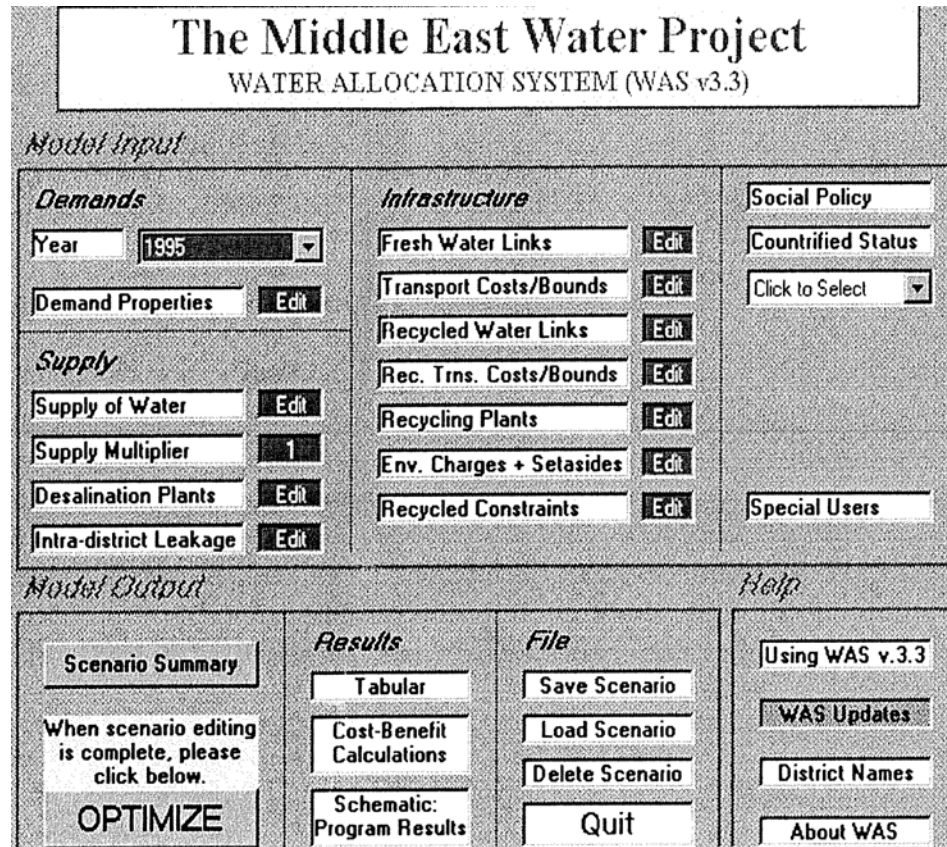
The following example is among the gains that would arise: The WAS model strongly suggests that it would be efficient to have a water treatment plant in Gaza with treated effluent sold to Israel for agriculture use. Both parties would gain, and it would be a serious act of cooperation between them. Thus it means that Israel has an economic interest in assisting with the construction of a Gaza treatment plant.

Figure 8.a shows an example of the main menu that the user sees when using WAS. Given the choice made by the user, the model allocates the available water so as to maximise total net benefits from water. These are measured as the total amount that consumers are willing to pay for the water supplied minus the cost of providing it.

WAS generates a shadow value for water in each district. The shadow value of water in a district shows the amount by which net benefits would increase if there were an additional cubic meter of water available there. It is the true value of

additional water in that district. Similarly, the shadow value of water at the source is the scarcity rent of water in that source.

Figure 8.a Water Allocation System: WAS Main Menu



Source: Fisher 2002, pp. 188

WAS provides a powerful tool for the analysis of the costs and benefits of various infrastructure projects. For example, if one runs the model without assuming the existence of seawater desalination facilities, then the shadow values in coastal districts provide a cost target that seawater desalination must meet to be economically viable. Alternatively, by running the model with and without a desalination plant, one can find the increase in annual benefits that the plant in question would bring. Taking the present discounted value of such increases gives the net benefits that should be compared with the capital cost of plant construction. (Fisher, 2002)

A water treaty that merely defines the parties' water ownership can become out of date as situations change. Water quantity allocations that appear adequate at one time may not be so at other times. By contrast, an agreement to trade in water permits, as described, provides a flexible way of adjusting water-use allocations, with

all parties benefiting from the adjustment. This can prevent water from becoming a source of new or reawakening tension.

For a region to fully achieve these benefits, it is appropriate to include all countries whose water conditions are interdependent and to construct a multiyear model, because withdrawals from aquifers today have important implications for water supply in the future.

It is important to say that economic benefits have not been explicitly used in allocating water, although economic principles have helped guide definitions of beneficial uses. Economic considerations alone may not provide an acceptable solution to water allocation problems, especially to solve water allocation disputes between nations.

Although economic criteria have never been explicitly used to determine water allocations in an international treaty and, while in some cases States have compensated co-riparian for water, no international water market has ever been established.

Furthermore, treating water as a purely economic item means that its various functions are considered to have values that can be measured in monetary terms. However, the values linked to water are often complementary and cannot be replaced by money. Water for life must be recognized as the highest priority in order to guarantee the sustainability of ecosystems, so access for all to a minimum quantity of good quality water is recognized as a human right.

Water for general interest purposes should be ranked as the second level of priority, in connection with citizen's social rights and in the general interest of society as a whole. Water for development, which is an economic function relating to production activities should be placed at the third level of priority. This function consumes the largest part of all water resources, and is largely responsible for the problems of scarcity and pollution.

8.5 Conclusion

An in-depth analysis of what have been previously observed shows that the concepts of water as a basic need and water as a human right appears that they have often been used without a clear understanding of their differences and possible policy and financial implications.

The situation changed somewhat when the UN Committee on Economic, Social and Cultural Rights issued General Comment No. 15 in January 2003. This Comment reinterpreted Articles 11 and 12 of the International Covenant on Economic, Social and Cultural Rights (ICESCR). It stated that:

‘Water is a limited natural resource and a public good fundamental for life and health. The human right to water is indispensable for leading a life in human dignity...’

‘...The right to water contains both freedoms and entitlements. The freedoms include the right to maintain access to existing water supplies necessary for the right to water, and the right to be free from interference, such as right to be free from arbitrary disconnections or contamination of water supplies. By contrast, the entitlements include the right to a system of water supply and management that provides equality of opportunity for people to enjoy the right to water’. (Abu-Zeid, O’Neil. 2008)

Effective water management is required in order to meet the needs of present and future generations and protect the environment. Large numbers of factors are involved in this context, such as hydrology, the political situation, the cultures of the countries concerned, and especially the types of management issues.

The co-operative approach addresses the interests of the involved parties directly, as well as the dynamics of conflict and co-operation affecting the relationship between them. Military intervention is often needed in highly escalated conflicts where mutual destruction can only be avoided by outside intervention. The conflict between Israel and the Palestinians could be taken as an example as well as the last conflict between Israel and Lebanon (July 2006). As this high form of escalation is rare for international conflicts, the military form of problem solving will not be discussed in this research.

8.5.1 General conflict management and its characteristics

When dealing with the question of conflict management, there must be a shift away from the focus on causes of conflict to a focus on the linkages of factors influencing the conflict in the present moment. This shift also entails focusing on the future solution rather than on the past problem.

The conflict potential of international river basin varies considerably, it is characterised by the following elements:

- The importance of the water supply for the riparian state;

- The power of the riparian state, mainly military;
- The position of the riparian state (upstream/downstream).

Despite the conflict potential of international rivers, there have been no major armed conflicts over water at the level of the nation state (Wolf, 1995). It is important to signal that the relationship between water stress and armed conflict is complex, and that water is often only one factor among others.

The leading question is not who is right or who is wrong (a legal question), and neither who is more powerful (a military or economic question), but whether there are ways of transforming the conflictive relationships to a cooperative relationship, and finding “win-win” solutions to satisfy the interests of all parties involved. Accordingly, the debate within this field is how much to focus on resolutions and problem-solving and how much on process, perceptions and relations.

8.5.2 Most Significant Principles

Some of the main principles of conflict management are summarized as follow:

- All human relationships are characterized by the respective power of the parties, the rules governing their interaction, and negotiations between them. When power asymmetry between conflict parties is great, rules are non-existent or unjust, and the powerful side doesn't compromise. The lower the unbalanced power between parties the greater the will to co-operate, the better the chances that negotiations lead to success;
- The recognition of the right to exist for the opponent, plus the acknowledgment of one another and the validity of the other parties' interests. Conflict cannot be resolved in the long run without satisfying basic human needs. Shedding light on the underlying interests can open a way forward to finding mutually compatible management options.
- The brain storming phenomena, conflicting parties should participate directly in jointly shaping a solution as they know the situation best and they easily stick to agreements they are active in formulating. This can be achievable only when people interact with each other in a co-operative way. In this context, unofficial experts who meet in informal

settings are often more flexible about developing and brainstorming management options, as they do not need to defend official policies.

- Intervention by a third party is needed at some stage, especially when conflict escalates above a certain level. In this regard, the third party acts as a repository of trust and facilitates co-operative interaction between the parties. This intervention by a third party depends on the level of escalation starting with the prevention and moderation, continuing with facilitation and mediation, and ending with peace enforcement and peace-keeping in highly escalated conflicts.
- The interpretation of scientific data is uncertain; accordingly, it is difficult to create a joint problem definition. Fact-finding and technical analysis should not be separated from the main negotiation efforts. The perceptions and the relationship between the parties cannot be ignored, as the best technical solutions can only be implemented if people accept and support them.
- The design of a conflict management process requires taking the context of the conflict into account. Mediation between conflict parties that represent groups involves steps to ensure that groups mandate actors from their group to represent them during the mediation, and that these people are reintegrated into their groups after the mediation.

Four steps are involved:

- 1-** Design the conflict management architecture (who are the actors, in what forums do they meet, what is the timeframe?). This preparation is called “pre-mediation”;
- 2-** Resume the many involved actors and issues until one arrives at a manageable number, this can happen for example with forums open to everyone;
- 3-** Manage the actual negotiation or mediation process;
- 4-** Support the transfer of the settlement in the mediation back to their greater socio-political context.

One of the greatest challenges of conflict management does not only concern the economic regulation or mathematical allocation of scarce resources, but the form of communication between the concerned parties. The focus of human relationships

can also be used by one conflict party aiming at winning the opponent over. In this context, three requirements are needed:

- 1- The good will of one party towards the opponent. Non-violence is not effective if it is used to cover fear and powerlessness;
- 2- Respects and understanding to concerned society's laws and culture, in well defined circumstances, in order to judge which rules are unjust, and which rules are to be taken into account;
- 3- Minimal acceptance of party's right to existence.

8.5.3 Multilateral talks and the identification of Common Denominators

Dealing with population size and conservation measures, promoting awareness and adopting water-saving technologies and pricing techniques, especially in agriculture, are essential to reduce demand. The private sector, non-governmental organizations, international and national agencies can play a major role both as investors and as managers of utilities. It is the common responsibility of all actors of society: businesses, governments, scholars, researchers and individuals, to contribute to the elaboration of numerous solutions. In addition, learning from their efforts and efforts in other regions interested parties must promote a new water and environmental ethic, educate the masses and facilitate discussion.

Perceptions concerning water relations in Lebanon and Israel should be assessed using explorative expert interviews, a conflict-sensitive research method. Interviews must be carried out in Lebanon and Israel. Dialogue workshops have to be organized with the aim of a joint publication on the subject by academics from the respective countries.

The workshops emphasize the role of communication in understanding different perceptions, and can clarify issues at stake and support the development of a research network. Pre-conditions for communication to work are that there is a potential benefit for each actor. Communication facilitates and enhances cooperation, which is a prerequisite of sustainable development, in an atmosphere of trust and confidence.

The dialogue workshops publications have to have authors from different sides working together to develop an all-inclusive view of the issues and lessons learned. As Conflicts are characterized by biased information coverage, science can contribute to conflict management by minimizing bias and providing "objective"

information to stakeholders and third parties. It is also necessary that the participated speakers have to share their views in terms of their multidisciplinary research, without any political or diplomatic representation. The geographic scope should be based on a wide definition of the nations bordering on the eastern Mediterranean Sea from Turkey in the north to Egypt in the south.

The role of these Workshops is to provide a “neutral” analytical background on the following ten points:

1- Assessing freshwater balances that represent the first step in exploring prospects for regional cooperation in the sharing and management of fresh water. The following should be taken into account: Justice and respect for international law, and the necessity of making some concessions that take into account the reality on the ground.

2- By focusing on needs rather than on rights the number of options that can satisfy the different interests increase and compatible solutions can be developed more easily.

3- The acknowledgment of water as a human right, which *“entitles everyone to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic uses”* (CESCR, 2002). (This definition has been provided by the General Comment No. 15, Committee on Economic, Social and Cultural Rights. This Covenant is one of the major human rights treaties that have been adopted and are being monitored within the framework of the United Nations human rights system. It has been in force since 1976 and currently 153 States have ratified the treaty and are therefore legally bound by it. This means they are obliged to implement the provisions of the treaty at the national level). Here we should distinguish between the “Right to Water” and “Water Rights”, the first can be considered as an integral part of other human rights, such as the right to life and the rights to health. The latter generally refers to accessing or using water for specific purposes.

4- Recognizing the different functions and values of water:

- Water for life, which must be recognized as the highest priority in order to guarantee the sustainability of the ecosystems;
- Water for general purposes, which should be ranked at the second level of priority, and;

- Water for development, which is an economic function, and must occupy the third level of priority.

5- In order to set up a priority among users' rights and management standards for each level mentioned in point 4, it is important to recognize different categories of values in question and the ethical criteria of fairness and sustainability. In other words, to recognize an ethic that enables to distinguish between the values of water and the various functions, in order to prioritize fundamental human rights over private and market interests, without neglecting economic efficiency with regard to the purely economic functions of water.

6- The values of preservation of the environment and aquatic systems, and the fundamental values of life are linked; accordingly the values related to water are often complementary and cannot be measured in monetary terms, and should not be administrated according to market rules.

7- Efficiency and effectiveness should be the core of any discussion. The former for economic reasons and the latter for the direction of values linked to the respect of human rights. Accordingly, no government or authority has a valid excuse for not securing the necessary investments to construct and modernize basic networks and systems to guarantee access to drinking water for all. Even in the poorest country the argument of lack of financial means is unacceptable while military spending proceeds.

8- The potential for dealing with a variety of regional conflicts over water can be significantly enhanced with the good application of management and pricing regimes. Many argue that one of the roots of many socio-economic/political problems is a lack of cooperatively managed resources. A shift of focus from the environment as a cause of conflict to the environment as an issue in cooperative conflict management should be taken into consideration.

9- The physical reality should be taken into account: For example, a natural river basin not the political borders.

10- The role of multilateral talks in identifying common denominators in the concerned parties' water resources management systems and the ability to cooperate on the basis of these denominators. [The Declaration of Principles for Cooperation on Water-Related Matters and New and Additional Water Resources, February 13, 1996] (Appendix 5, Annex 1)

There is no doubt that no single set of actors holds the key to effectively addressing the challenge of equitable and sustainable management of precious water resources. It is also important to realize that it is not enough just to seek to increase the availability and usability of water. It is essential to reduce the demand for water by managing population size, enacting conservation measures, promoting awareness and adopting water-saving technologies and pricing techniques, especially in agriculture. Governments, both national and local, hold the key responsibility.

However, the private sector, non-governmental organizations, international agencies and national agencies can play a major role both as investors and as managers of utilities. In fact, it is the common responsibility of all actors of society: businesses, governments, scholars, researchers and individuals, to contribute to the elaboration of numerous solutions. In addition to learning from their efforts and efforts in other regions, interested parties must promote a new water and environmental ethic, educate the masses and facilitate discussion.

The 'promised land' will not fall from heaven, it will be built with the arms and hearts of those who seek and build peace. Either the heavenly Jerusalem of the Apocalypse exists on earth, or it does not exist. This is the Jerusalem of which Psalmist prays:

(6-9) *Pray for Jerusalem's peace!*

Prosperity to all you Jerusalem-lovers!

Friendly insiders, get along!

Hostile outsiders, keep your distance!

For the sake of my family and friends,

I say it again: live in peace!

For the sake of the house of our God, GOD,

I'll do my very best for you. (Psalm 122: 6-9).

Furthermore:

(2) *Then I, John, saw the holy city, New Jerusalem, coming down out of heaven from God, prepared as a bride adorned for her husband. (3)* *And I heard a loud voice from heaven saying, "Behold, the tabernacle of God is with men, and He will dwell with them, and they shall be His people. God Himself will be with them and be their God. (4)* *And God will wipe away every tear from their eyes; there shall be*

no more death, nor sorrow, nor crying. There shall be no more pain, for the former things have passed away. (Revelation 21:2-4)

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Acronyms

AFD	Agence Francaise du Developpement
AFSD	Arab Fund for Social Development
ARO	Agricultural Research Organization
AUB	American University of Beirut
BC	Budget Constraint
BOD ₅	The biochemical oxygen demand
BOOT	Build, Own, Operate and Transfer
CDR	The Council for Development and Reconstruction
CESCR	Committee on Economic, Social and Cultural Rights
CHF	Cooperative Housing Fund
CLIS	Council of Leading Islamic Scholars
CPCP	Coastal Pollution Control Program
CPSPS	Centre for Public Sector Projects and Studies
DOP	Declaration of Principles
ECEN	European Christian Environmental Network
ECODIT	A worldwide water and environmental management and international development consulting firm.
ENMOD	Environmental Modification Techniques
ESCWA	Economic and Social Commission for Western Asia
FAO	Food and Agriculture Organization
FBI	Federal Bureau of Investigation
GNP	Gross National Product
GOL	Government of Lebanon
Ha	Hectare
IAURIF	Institut d'Aménagement Urbain de la Région d'Ile de France

IC	Indifference Curve
ICESCR	International Covenant on Economic, Social and Cultural Rights
ICJ	International Court of Justice
ICWE	International Conference on Water and the Environment
IDRC	International Development Research Centre
IFM	Israel Foreign Ministry
ILA	International Law Association
ILC	International Law Commission
INWRDAM	Inter-Islamic Network on Water Resources Demand and Management
IRC	International Committee of the Red Cross
IRMP	Irrigation Rehabilitation and Modernization Project
IWC	International Water Courses
IWRA	International Water Resources Association
KFAED	Kuwaiti Fund for Arab and Economic Development
KKL-JNF	Keren Kayemeth LeYisrael-Jewish National Fund
LBP	Lebanese pound
LEDO	Lebanese Environment and Development Observatory
LRD	Litani River Department
MAC	Marginal Abatement Costs
MD	Marginal Damages
MERIA	Middle East Review of International Affairs
MEW	Ministry of Energy and Water
Mm ³	Million cubic meters
Mm ³ /yr	Million Cubic Meters per year
MNI	Ministry of National Infrastructures
MOA	Ministry of Agriculture

MOPH	Ministry of Public Health
MRS	Marginal Rate of Substitution
MRT	Marginal Rate of Transformation
MWGWR	<i>Multilateral Working Group on Water Resources</i>
NCSR	National Council for Scientific Research
NDU	Notre Dame University
NERP	National Emergency and Rehabilitation Program
NIS	New Israeli Sheqel
NGO	Non Government Organizations
NO ₃	Nitrates
PBUH	Peace be upon him
PDA	Professional Divers' Association
PLO	Palestine Liberation Organization
PNA	Palestinians National Authority
PPF	Production Possibilities Frontier
PPM	Parts per million
R&D	Research and Development
TVA	Tennessee Valley Authority
ULR	Ultra Low Rate
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNICEF	United Nations International Children's Emergency Fund
UNRWA	United Nations Relief and Works Agency (for Palestine Refugees)
U.S.A.	United States of America
USEPA	US Environmental Protection Agency

USSR	Union of Soviet Socialist Republics
WAS	Water Allocation System
WHO	World Health Organization
WRMIW	Water Resources Management in the Islamic World
WRPP	Water Resources Protection Program
WUE	Water Use Efficiency

Glossary

Abrahamic religion: It is a term of Islamic origin, commonly used to designate the three prevalent monotheistic religions – Judaism, Christianity, and Islam – which claim Abraham (Hebrew: *Avraham* אַבְרָהָם ; Arabic: *Ibrahim* إبراهيم) as a part of their sacred history.

Action Research: It is a type of applied research designed to find an effective way of bringing about a conscious change in a partly controlled environment (*Collis J. and Hussey R., 2003*).

Case study: It is an extensive examination of a single instance of a phenomenon of interest and is an example of a phenomenological methodology.

Conflict management: A generic term that refers to all interventions in a conflict with the aims of solving problems, transforming relations, and changing structures.

Conflict transformation: Conflict transformation acknowledges that conflict is a part of life; the aim is to transform destructive forms of dealing with conflict to constructive ones. It focuses on understanding perceptions and improving relationships by empowering actors and supporting recognition of each other.

Co-operation: It is understood as distinct from harmony and definitely as distinct from discord / conflict.

Dialogue workshop: In Dialogue Workshops, non-official representatives of the conflict parties meet in an informal setting facilitated by a third party with the aim of non-polemical conflict analysis, transformation of antagonistic relationships, joint action, or problem-solving.

Epistemology: It is concerned with the study of knowledge and what we accept as being valid knowledge. The epistemology can be classified as objectivist; the researchers accepting this view hold that if they go about their research in the correct way it is possible to discover objective truth (Crotty, 1998).

Ethnography: It is an approach in which the researcher uses socially acquired and shared knowledge to understand the observed patterns of human activity.

Evapotranspiration: It is a term used to describe the sum of evaporation and plant transpiration from the earth's land surface to atmosphere. Evaporation accounts for the movement of water to the air from sources such as the soil, canopy

interception, and water-bodies. Transpiration accounts for the movement of water within a plant and the subsequent loss of water as vapor through stomata in its leaves. Evapotranspiration is an important part of the water cycle. An element (such as a tree) that contributes to evapotranspiration can be called an evapotranspirator (wikipedia.org 2008).

Grounded theory: It is an approach for looking systematically at qualitative data aiming at the generation of theory. Sometimes, grounded theory is seen as a qualitative method, but grounded theory reaches further: it combines a specific style of research (or a paradigm) with pragmatic theory of action and with some methodological guidelines (wikipedia.org, 2008).

Hydraulic imperative: A theory that describes the quest for water resources as the motivator for military conquests, and was developed in the academic literature and the popular press since Israel's invasion of Lebanon 1982 (see section 1.2).

Mediation: Mediation is a way of transforming and/or resolving conflicts with the support of an even-handed third party that is accepted by all the involved conflict parties. The mediator structures and guides the process, facilitates communication between the conflicting parties and seeks to empower the parties in resolving/transforming their conflict. The mediator does not provide any solutions.

Need: A condition or situation in which something is required. In this context 'needs' refer to basic needs, e.g. the need for independence (security, economic well-being, control over one's life) and relatedness (a sense of belonging, recognition, relationship). According to the human needs theory, conflicts can only be resolved in the long term if basic needs are satisfied.

Parties: People or groups of people involved in a conflict. A "third party" is someone who is not initially involved in the conflict, but who gets involved to try to help the disputants work out a solution (or at least improve the situation by communicating better or increasing mutual understanding). Examples of third parties are mediators, arbitrators, conciliators, and facilitators.

Proposal-disagreement: Eric Johnston's efforts to settle the water issue in the mid-50s failed mostly because as long as the Arabs accepted a plan, Israel would reject it because it wasn't granted access to the Litani waters. And the other way round, the Arabs couldn't say yes to a proposal and decide for example on the Litani due to political reasons (see section 1.2).

Quantitative vs. Qualitative: “in quantitative research facts act to constrain our beliefs; while in interpretive research beliefs determine what should count as facts” (Smith, 1983, p. 10)

Research methodology: Methodology refers to the overall approach to the research process, from the theoretical underpinning to the collection and analysis of the data.

Research methods: They are described as the techniques or procedures used to gather and analyse data related to some research question (Crotty, 1998).

River Basin: Or a drainage basin which is an extent of land where water from rain or snow melt drains downhill into a body of water, such as a river, lake, reservoir, estuary, wetland, sea or ocean. The drainage basin includes both the streams and rivers that convey the water as well as the land surfaces from which water drains into those channels, and is separated from adjacent basins by a drainage divide. The drainage basin acts like a funnel, collecting all the water within the area covered by the basin and channeling it into a waterway. Each drainage basin is separated topographically from adjacent basins by a geographical barrier such as a ridge, hill or mountain, which is known as a water divide. Other terms that are used to describe a drainage basin are *catchment*, catchment area, catchment basin, drainage area, river basin, water basin and watershed (wikipedia.org, 2008).

Virtual Water: Water that is imported in the form of food. It is easier to import water in the form of food, e.g. cereals, than it is to transport water. “Virtual water” can be approximated by the following rule of thumb: one kg of bread requires about 1,000 litres of water for its production, one kg of meat is approximately equivalent to 4,000 litres (Allan 1998).

Watercourse: This term encompasses a system of surface waters and groundwater with a physical relationship to each other

Appendix 1

Annex 1: the Relevant Articles for the Section 5.2

(Vinogradov, S., Wouters, P. and Jones P. 2004)

Article 5: Equitable and reasonable utilization and participation

- Watercourse States shall in their respective territories utilize an international watercourse in an equitable and reasonable manner. In particular, an international watercourse shall be used and developed by watercourse States with a view to attaining optimal and sustainable utilization thereof and benefits there from, taking into account the interests of the watercourse States concerned, consistent with adequate protection of the watercourse.

- Watercourse States shall participate in the use, development and protection of an international watercourse in an equitable and reasonable manner. Such participation includes both the right to utilize the watercourse and the duty to cooperate in the protection and development thereof, as provided in the present Convention.

Article 6: Factors relevant to equitable and reasonable utilization

- The weight to be given to each factor is to be determined by its importance in comparison with that of other relevant factors. In determining what is a reasonable and equitable use, all relevant factors are to be considered together and a conclusion reached on the basis of the whole.

Article 7: Obligation not to cause significant harm

- Watercourse States shall, in utilizing an international watercourse in their territories, take all appropriate measures to prevent the causing of significant harm to other watercourse States.

- Where significant harm nevertheless is caused to another watercourse State, the States whose use causes such harm shall, in the absence of agreement to such use, take all appropriate measures, having due regard for the provisions of articles 5 and 6, in consultation with the affected State, to eliminate or mitigate such harm and, where appropriate, to discuss the question of compensation.

Article 10: Relationship between different kinds of uses

- In the absence of agreement or custom to the contrary, no use of an international watercourse enjoys inherent priority over other uses.

- In the event of a conflict between uses of an international watercourse, it shall be resolved with reference to the principles and factors set out in articles 5 to 7, with special regard being given to the requirements of vital human needs.

Article 33: Settlement of disputes

- In the event of a dispute between two or more Parties concerning the interpretation or application of the present Convention, the Parties concerned shall, in the absence of an applicable agreement between them, seek a settlement of the dispute by peaceful means in accordance with the following provisions.

- If the parties concerned cannot reach agreement by negotiation requested by one of them, they may jointly seek the good offices of, or request mediation or conciliation by, a third party, or make use, as appropriate, of any joint watercourse institutions that may have been established by them or agree to submit the dispute to arbitration or to the International Court of Justice.

- ... If after six months from the time of the request for negotiations ... the Parties concerned have not been able to settle their dispute through negotiation or any other means ... the dispute shall be submitted, at the request of any of the parties to the dispute, to impartial fact-finding. ...

- A Fact-finding Commission shall be established, composed of one member nominated by each party concerned and in addition a member not having the nationality of any of the parties concerned chosen by the nominated members who shall serve as Chairman.

- The Commission shall adopt its report by majority vote, unless it is a single-member Commission, and shall submit that report to the parties concerned, setting forth its findings and the reasons therefore and such recommendation deems appropriate for an equitable solution of the dispute, which the Parties concerned shall consider in good faith.

Annex 2: *International Regulation regarding the Use of International Watercourses for Purposes other than Navigation*

http://www.cawater-info.net/bk/water_law/pdf/madrid_1911_e.pdf

Declaration of Madrid, 20 April 1911

Statement of Reasons

Riparian States with a common stream are in a position of permanent physical dependence on each other which precludes the idea of the complete autonomy of each State in the section of the natural watercourse under its sovereignty.

International law has dealt with the right of navigation with respect to international rivers but the use of water for the purposes of industry, agriculture, etc. was not foreseen by international law.

It therefore seems expedient to remedy this lack by noting the rules of law resulting from the interdependence which undoubtedly exists between riparian States with a common stream and between States whose territories are crossed by a common stream.

With the exception of the right of navigation, as already established or to be established by international law:

The Institute of International Law is of the opinion that the following regulations should be observed from the point of view of (any) use of international streams.

I. When a stream forms the frontier of two States, neither of these States may, without the consent of the other, and without special and valid legal title, make or allow individuals, corporations, etc. to make alterations therein detrimental to the bank of the other State. On the other hand, neither State may, on its own territory, utilize or allow the utilization of the water in such a way as to seriously interfere with its utilization by the other State or by individuals, corporations, etc. thereof.

The foregoing provisions are likewise applicable to a lake lying between the territories of more than two States.

II. When a stream traverses successively the territories of two or more States:

1. The point where this stream crosses the frontiers of two States, whether naturally, or since time immemorial, may not be changed by establishments of one of the States without the consent of the other;

2. All alterations injurious to the water, the emptying therein of injurious matter (from factories, etc.) is forbidden;

3. No establishment (especially factories utilizing hydraulic power) may take so much water that the constitution, otherwise called the utilizable or essential character of the stream shall, when it reaches the territory downstream, be seriously modified;

4. The right of navigation by virtue of a title recognized in international law may not be violated in any way whatsoever;

5. A State situated downstream may not erect or allow to be erected within its territory constructions or establishments which would subject the other State to the danger of inundation;

6. The foregoing rules are applicable likewise to cases where streams flow from a lake situated in one State, through the territory of another State, or the territories of other States;

7. It is recommended that the interested States appoint permanent joint commissions, which shall render decisions, or at least shall give their opinion, when, from the building of new establishments or the making of alterations in existing establishments, serious consequences might result in that part of the stream situated in the territory of the other States.

Annex 3: Israeli-Syrian Water Diversion Dispute: United Nations Security Council Resolution, October 27, 1953 (1)

The Security Council,

Having taken note of the report of the Chief of Staff of the Truce Supervision Organization dated 23 October 1953 (S/3122), (2)

Desirous of facilitating the consideration of the question, without however prejudicing the rights, claims or position of the parties concerned,

Deems it desirable to that end that the works started in the Demilitarized Zone on 2 September 1953 should be suspended during the urgent examination of the question by the Security Council,

Notes with satisfaction the statement made by the Israel representative at the 631st meeting regarding the undertaking given by his Government to suspend the works in question during that examination, (3)

Requests the Chief of Staff of the Truce Supervision Organization to inform it regarding the fulfillment of that undertaking (4)

(1) U.N. doc. S/3128, Oct. 27, 1953. The resolution was adopted following a complaint by Syria concerning Israeli activity on a hydroelectric project involving the diversion of the Jordan River at Banat Yaacov in the Syrian-Israeli demilitarized zone.

(2) The report stated, among other things, that the Chief of Staff of the Truce Supervision Organization had informed Israel on Sept. 23, that the work in the demilitarized zone should cease "so long as an agreement is not arranged."

(3) U.N. Security Council, Official Records, 631st Meeting, Oct. 27, 1953, p. 5.

(4) The Security Council continued to consider this question. In December 1953 the United States, the United Kingdom, and France sponsored a resolution which among other things, supported the Chief of Staff in his decision with regard to stopping the diversion project, called upon him to maintain the demilitarized character of the zone, and authorized him to explore conciliation possibilities. The Soviet Union opposed the resolution on the ground that bilateral consent and not the decision of the Chief of Staff was the basis for permitting any undertaking in the demilitarized zone, and vetoed the resolution on Jan. 22, 1954. It was its 57th veto. For statements by the U.S. Representatives in the Security Council on Dec. 16 and 21, 1953, and Jan. 21, 1954, in connection with the draft resolution, see Department of State Bulletin, Jan. 11, 1954, pp. 58-59, and Feb. 22, 1954, pp. 297-298. For background discussion see United States Participation in the United Nations: Report by the President to the Congress for the Year 1953 (Department of State publication 5459; 1954), pp. 77-78; *ibid.*, 1954 (Department of State publication 5769; 1955), pp. 73-74; and Report of the Security Council to the General Assembly Covering the Period from 16 July 1953 to 16 July 1954 (A/2712), pp. 15-29.

Source: *American Foreign Policy 1950-1955, Basic Documents Volumes I and II, Department of State Publication 6446, General Foreign Policy Series 117, Washington, DC : U.S. Government Printing Office, 1957.*

Annex 4: Lac Lanoux Case

(Affair du Lac Lanoux, Espagne versus France, 1957)

(UNEP – ELI/PAC, 1998)

The *Lac Lanoux* arbitration case involving France and Spain shows how the process of prior consultation and negotiation has been interpreted by an international arbitral tribunal, not only as a treaty stipulation, (specifically the Bayonne Treaty of 1866 between France and Spain), but more generally as a principle of customary law.

Background

The Lac Lanoux negotiations began in 1917. The case was put to arbitration in 1956.

Lake Lanoux is located on the French side of the Pyrenees mountain chain. It is fed by many streams rising in

France and running only in the French territory. However, its waters also run into the headwaters of the river Carol which, some 25 kilometres from the lake, do cross the Spanish frontier at Puigcerda, having previously fed the Canal of Puigcerda, which is the private property of that town. After some 6 kilometres in Spanish territory, the Carol joins the Segre, which ultimately flows into the Ebro. The frontier between France and Spain was fixed by the Treaty of Bayonne, 1866 and an additional Act thereto, whereby regulations were made for the joint use of the water resources.

Spain alleged that certain plans proposed by France would adversely affect Spanish rights and interests contrary to the Treaty, and could only be undertaken with prior consent of both Parties.

Award

In the light of the agreement between the two countries (treaty of Bayonne, 1866, and Additional Act), the tribunal found that the conflicting interests aroused by the industrial use of international rivers must be reconciled by mutual concessions embodied in the agreements which needed to be interpreted. In the present case, the Tribunal was of the opinion that “the French scheme complied with the obligations of Article 11....In carrying out without prior agreement between the two

Governments, works for the utilization of the waters of Lake Lanoux...and brought to the notice of the representatives of Spain...., the French Government was not committing a breach of the provisions of the Treaty of Bayonne...or of the Additional Act”.

The Tribunal said that, because the question before it related uniquely to a treaty of 1866, the tribunal would apply the treaty if it was clear. But if interpretation was necessary, the tribunal would turn to international law, allowing it in this case to take account of the “spirit” of the *Pyrennées treaties* and “*des règles du droit international commun*”, and also consider certain rules of customary international law in order to proceed to the interpretation of the Treaty and the Act.

Commentary

The tribunal discussed the applicable law because the Parties (France and Spain) disagreed on this issue of international rights and obligations of States sharing common natural resources such as water. Consultations and negotiation in good faith are necessary not only as a mere formality, but as an attempt to conclude an agreement for the prevention of conflicts.

Annex 5: Efficiency in Production and the Production Possibilities Frontier

Two major problems prevent society from achieving economic efficiency:

Unemployment of available resources:

In order to have economic efficiency all available resources must be employed, whenever there are available resources standing idle, there are fewer inputs into economy's productive process. As a result, there is a lower output of goods to satisfy society's wants.

Underemployment or resource misallocation:

If certain available resources are used to do jobs for which other available resources are better suited there is underemployment, or misallocation of resources. In other words, reallocation of resources to productive activities for which they are better suited will result in a larger output of some or all goods and no reduction in the output of any.

When there is no unemployment or underemployment of available resources, an economy is able to produce the maximum number of goods possible. When this occurs the economy is said to be on its Production Possibilities Frontier (PPF). This PPF is a curve connecting the maximum possible output combinations of goods for a fully employed economy.

The economy is producing its maximum possible output of goods when an economy's available resources are fully employed. The maximum possible output level is limited too. Therefore, producing more of one kind means, producing less of another. Let us illustrate this concept by focusing on the issue of cleaning up environmental pollution. Suppose that the output in an economy may be divided into two categories:

- X an antipollution device.
- Y bundle contains one of each and every good produced in the economy except X.

If we want a cleaner environment, we need to use X in many production processes that cause pollution. How do we measure the cost to society of providing these devices?

Product	A	B	C	D	E
X	0	50	80	100	110
Y	80	60	40	20	0

Table a. Possible combinations of X and Y produced (hypothetically) in a full-employment economy. These numbers represent Production Possibilities (output/year in thousands)

Given the existing supply of resources and level of technology, society must make a choice. Table a shows different possible combination an economy have that may be produced when using all of its resources. Moving from point A to E, resources must be shifted out of the production of Y and into the production of X.

Whenever scarcity forces an economy to make a choice, a cost must be paid, called opportunity cost. This cost is measured in terms of foregone alternatives.

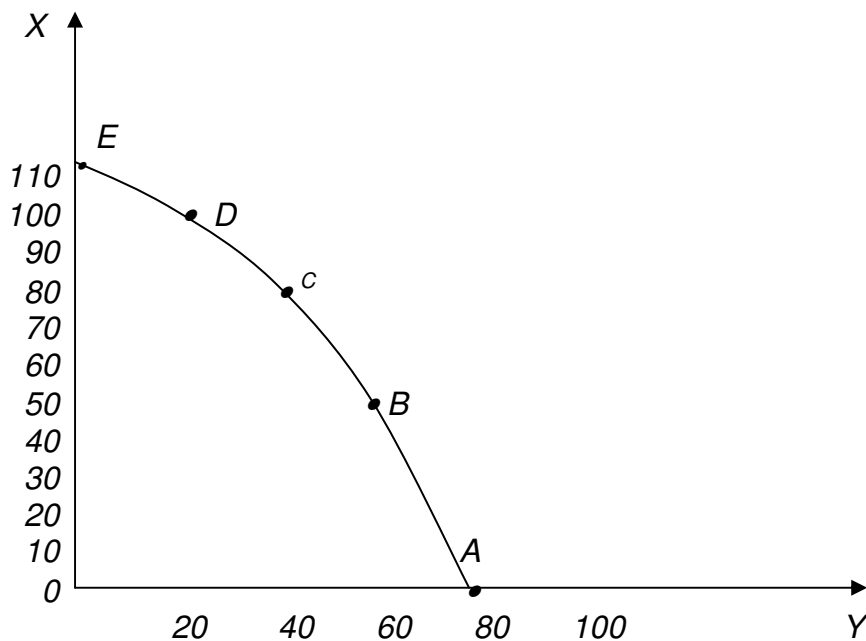


Figure a: Production Possibilities Frontier (PPF)

Each point on the downwards-sloping curve (Fig. a) represents some maximum-output combination for an economy whose available resources are fully employed. No combination to the right or above the curve is possible given the available resources. On the other hand, any point to the left represents a combination produced when the economy is operating inefficiently. Moving along the curve (moving from point A to E), represents a shift in resources out of the production of Y and into the production of X, this phenomena is called sometimes the law of increasing cost.

The law of increasing cost is: When moving along the PPF, the cost per additional unit obtained, measured in terms of the unit sacrificed, rises due to the difference in productivity of resources when used in different production process. The shape of PPF is determined by what is called the Marginal Rate of Transformation (MRT), which is the magnitude of the slope of the frontier at each point. The MRT measures how much Y must be given up to produce one additional unit of X.

Whenever there are changes in the existing supply of resources (land, labour and capital) or/and level of technology, the position of PPF will change. Therefore an economy's present choice of a point on its PPF influences the future location of that frontier.

An economy can fall short of its PPF if resources are misallocated or if the best-known production techniques are not used. Another kind of economic inefficiency also occurs whenever available resources are allowed to stand idle. This will also keep an economy from operating on its PPF.

Given an economy's available resources and technology, knowledge of what is possible is necessary in order to answer a number of important questions or problems that an economy, in socialist, communist or capitalist countries, must solve. These questions are:

- What and how much to produce?
- How should production be organised?
- For whom should goods be produced?

The answer to the question of what to produce determines the nature and location of the PPF. The answer to the question of how much to produce determines the point chosen on the PPF.

How to organise production determines whether the chosen point will be reached. Ideally, society should allocate available resources to productive activities and use known productive techniques in such a way that no reallocation of resources or change of technique could yield more of any good without yielding less of another. This is true of any combination of goods represented by any point on the PPF. For whom to produce is largely determined by ideological orientation as to the proper mix of free markets, government regulations and central planning.

Annex 6: Marginal Damages Function and Marginal Abatement Costs Function

a. By damages we mean all the negative impacts that user of the environment experience as a result of the degradation of the environment. In the river pollution example, damages were to who could no longer use the river or who suffered a higher chance of picking up water-borne diseases, and to all city dwellers that had to pay more to treat the water before they could put into the public water mains. In general, the greater the pollution, the greater the damages it produces.

To describe the relationship between pollution and damage, we will use the idea of a damage function. A damage function shows the relationship between the quantity of a residual and the damage that residual cause.

Marginal Damages Function shows the change in damages resulting from a unit change in emissions or ambient concentration. To note that, graphically, the areas under marginal damage functions correspond to total damages. The height and shape of a damage function depends on the pollutant and circumstances involved.

b. Abatement Costs are the costs of reducing the quantity of residuals being emitted into the environment, or of lowering ambient concentrations. On the assumption that one of the two countries has free access to the river, the cheapest way to get rid of the wastes is simply to pump them into the river, but normally there are technological and managerial mean to reduce these emissions. The costs of engaging in these activities are called Abatement Costs, as they are the costs of abating, or reducing, the quantity of residuals dumped into the river.

This can be represented graphically by using the concept of the Marginal Abatement Costs Function, which shows the added costs of achieving a one-unit decrease in emission level, or alternatively the costs saved by a unit increase of emissions. The larger the reduction in emissions, the greater the marginal costs of producing further reductions and vice-versa. This determines the curve's slope.

c. The efficient level of emissions is defined as the level at which the marginal damages are equal to marginal abatement costs. In another words it is the level at which two types of costs (higher emissions expose society, or some part of it, to greater costs resulting from environmental damages. And lower emissions involve

society in greater costs in the form of resources devoted to abatement activities) exactly offset one another.

Annex 7: Externalities and Economic Efficiency; Efficiency in Exchange, and Efficient Allocations

In an efficient allocation of goods, no one can be made better off without making someone else worse off. To understand more we must show why mutually beneficial trades result in an efficient allocation of goods.

In general, voluntary trade between two people is mutually beneficial. How trade makes people better off? Two important assumptions:

- a.** Both people have complete information about each other's preferences.
- b.** Exchanging goods involve no costs, i.e. transactions costs are zero.

Suppose Maria (M), and Maroun (Mn) have between them two goods X and Y. Each consumer has different choices or different combinations of X and Y about which he or she feels indifferent as to whether has one of them or any combination. The consumer can list as many combinations as he or she wants until there is a continuum of points forming a curve. This curve is called Indifference Curve (IC), at which the consumer gets equal satisfaction at any point along it.

What is the best combination of these two goods the consumer can have? To answer this question, we note, for each and every consumer exist an unlimited number of (IC), a curve that lies to the right and above the existing one represents a higher level of satisfaction for the consumer, IC2 represents a higher level of satisfaction than IC1 for Maroun, and for Maria U3 then U2 (Figure 5.1). For both of them to decide which IC gives the level of satisfaction, they have to take into consideration their incomes and the prices of both goods X and Y.

In our model exist only two goods, both consumers must decide how much to spend on each good. This decision depends on their level of income, which can be called Budget Constraint (BC), BC can be illustrated (PP' Figure 3.1.a) as a straight line representing all possible combinations of goods that a consumer can obtain at a given prices by spending a given size budget [the slope of this line is equal to the price of good X (PX) divided by the price of Y (PY)]. Point G (Figure 5.1) represents the point of tangency of Maria and Maroun's ICs with their BC line, and at which the optimum purchase combination is determined, and also the highest possible level of satisfaction is realised (at this point $MRS (M) = MRS (Mn) = PX / PY$).

If Maria values X more than Y, and Maroun values Y more than X then there is room for mutually advantageous trade. These values are measured by Marginal Rate of Substitution (MRS), which is the rate at which the consumer is willing to substitute one good for another so as to leave his or her level of satisfaction unchanged.

Whenever two consumers' MRSs are different, there is room for mutually beneficial trade because the allocation of resources is inefficient. In other words, an allocation of goods is efficient only if the goods are distributed so that the MRS between any two pairs of good is the same for all consumers. This important result also holds when there are many goods and consumers.

If trade is beneficial, which of those trades will allocate goods efficiently among customers, and how much better off will the consumers then be? The answer to this question will be by using a diagram called an Edgeworth Box¹. Each point in the diagram simultaneously describes the market baskets of both consumers, under the assumption that there are fixed supplies of both goods. Which point is considered an efficient allocation? The answer depends on whether the MRS of each consumer is equal to the other's MRS.

As previously mentioned, an allocation of goods is efficient only if the goods are distributed so that the MRS of both consumers is the same at a particular point. Figure 5.1, shows the only place that MRSs for both consumers are identical, is when the indifference curves are tangent, E, F, G and H represent some possible efficient allocations of goods X and Y. When joining all these points we obtain the contract curve ($MRS(M) = MRS(M_n)$ at every single point along this curve). The contract curve shows all allocations from which no mutually beneficial trade can be made.

These allocations are sometimes called Pareto efficient allocations, after an Italian economist Vilfredo Pareto (1848-1923), who developed the concept of efficiency in exchange: An allocation is Pareto efficiency if goods cannot be reallocated to make someone better off without making someone else worse off. In other words, suppose we are in a competitive market, the bargaining outcomes depend on circumstances of each consumer. In this market there are many buyers

¹Named after political economist F.Y. Edgeworth, who suggested its use in his 1881 book: "Mathematical Psychics: An Essay on the Application of Mathematics to the Moral Sciences", New York, August M. Kelley, 1953.

and sellers, if people do not like the terms of an exchange, they can look for another seller who offers better terms. As a result, each buyer and seller takes the price of the goods as fixed and decides how much to buy and to sell at that price. At point G (Figure 5.1) the allocation in a competitive equilibrium is efficient, first because the ICs are tangent, all MRS between consumers are equal. Second, each IC is tangent to BC or the price line ($MRS (M) = MRS (Mn) = PX / PY$).

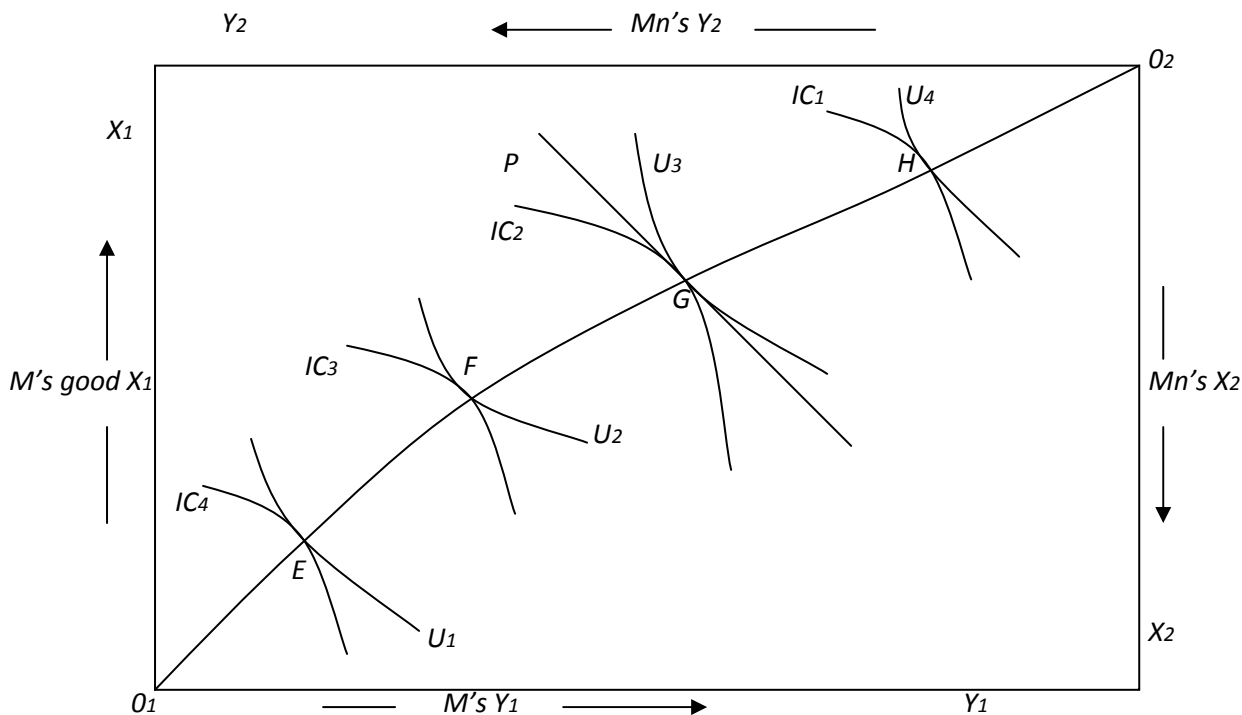


Figure 5.1 the Contract Curve

Are efficient allocations equitable? Economists and others disagree both about how to define equity and how to quantify it. As a result, no agreement on whether one efficient allocation is preferred to another is possible. One inefficient allocation of resources may be more equitable than another efficient allocation.

A competitive equilibrium leads to a Pareto efficient outcome. But that particular outcome may not be equitable. In fact, a competitive equilibrium could occur at any point on the contract curve, depending on the initial allocation. Because of that, society must rely to some extent on government to redistribute income or goods among households to achieve equity goals. These goals can be reached through the tax system, providing public services ...etc

Unfortunately, all programs that redistribute income in our society are costly. Taxes may encourage individuals to work less or cause firms to devote resources to

avoid taxes rather than producing output. For an economy to be efficient, it must not only produce goods at minimum cost, it must also produce goods in combinations that match people's willingness to pay for them.

The efficient combination of outputs is produced when the Marginal Rate of Transformation (MRT) between the two goods (which measures the cost of producing one good relative to the other) is equal to the consumer's MRS (which measures the marginal benefit of consuming one good relative to another). In a competitive output market, people consume to the point where their MRS is equal to the price ratio. Producers choose outputs, so that the MRT is equal to the price ratio also. Because the MRS equals the MRT the competitive output market is efficient. Any other price ratio will lead to an excess demand for one good and excess supply of the other. At point C (Figure 5.2) $MRS = MRT = P_X / P_Y$.

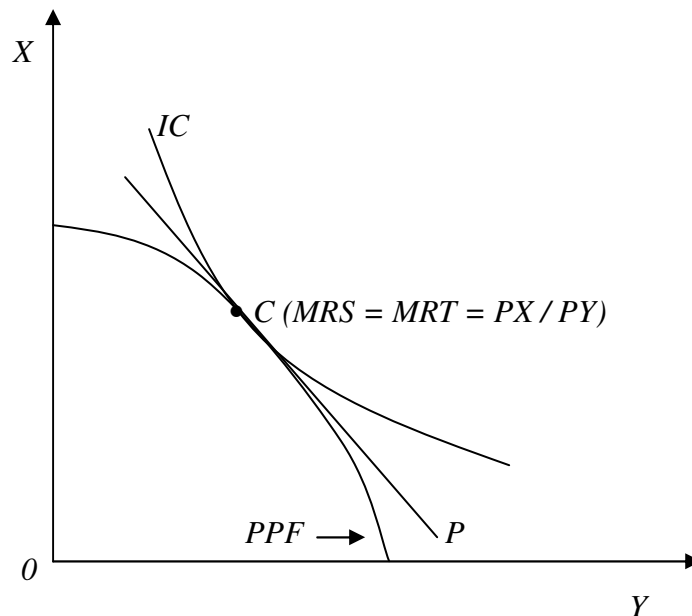


Figure 5.2 Output efficiency

It is important to say that one of the main reasons (actually there are four: monopoly power, incomplete information, public goods and externalities) of market's failure is externalities, which is considered as the effects of production and consumption activities not directly reflected in the market.

Externalities

An externality occurs when an agent's well being is directly affected by the actions of another agent, in other words it is a situation where one agent's actions, producing or consuming, imposes costs, or provides benefits, to other agents without paying compensation, or respectively receives a reward.

Externalities can be negative, when the action of one party imposes costs on another party, or positive, when the action of one party benefits another party. For example, a negative externality occurs when an upstream country (A) dumps its waste in a River that downstream country (B) is benefiting from, more waste will definitely leads to more negative outcomes.

The negative externality arises because country (A) has no incentive to account for the external costs that it imposes, due to its actions, when making its decision. A positive externality may occur when country (A) decides not to dump its waste in the River, hence positive outcomes (benefits) for country (B). With such external effects competitive equilibria need not be Pareto efficient and some government intervention may be necessary to achieve efficiency.

Various regulatory rules and pricing schemes have been developed to ensure that goods produced by increasing returns technologies and/or goods giving rise to externalities are efficiently provided.

Example, the polluter should pay the costs of their pollution. If consumption of a good at price p in quantity x imposes external pollution cost $C(x)$ on other consumers then governments should intervene to increase the price charged to $p + C'(x)$ by levying a tax t per unit of consumption equal to $C'(x)$ with tax t the external cost of consuming the good (previously unpaid for the pollution damage) is internalised and the externality disappears.

Government regulation can deal with the inefficiencies that arise from externalities. But this regulation is not the only way, in some circumstances inefficiencies can be eliminated through private bargaining among the affected parties, or by legal system in which parties can sue to recover the damages they suffer.

The concept that underlies the whole externalities' discussions is the concept of property rights. Property rights are the legal rules that describe what people may do with their property. They may build a house, sell the land, they are also protected from interference with their use of rights.

Property Rights

Private property rights are the dominant institutional arrangement in most developed economies of the west, developing countries also are moving in that direction. Private property in land is also a familiar arrangement. If someone owns a

piece of land, he or she has an incentive that the land is managed in ways that maximise its value.

Using the previous example, country (A) disposes its wastes in the River. If (A) has a property right, it has no incentive to include or to pay any cost associated with the damages done. If country (B) has a property right to clean water, it could demand that country (A) pays the costs associated with the damages. These costs will be internalised, and efficient allocation of resources could be achieved.

More explanation needed. Figure 5.3 shows that the marginal damages function, which is represented by the curve MD, and the marginal abatement costs function, which is represented by the curve MAC. The point of intersection of both curves represents the efficient level of emissions e^* (see appendix 1, annex 4 for more explanations).

Some assumptions are needed:

- The marginal damage function refers to all the damages suffered by country (A);
- The marginal abatement cost curve applies to the country emitting effluent into the River (B);
- Country (B) may use the River any way it wishes.

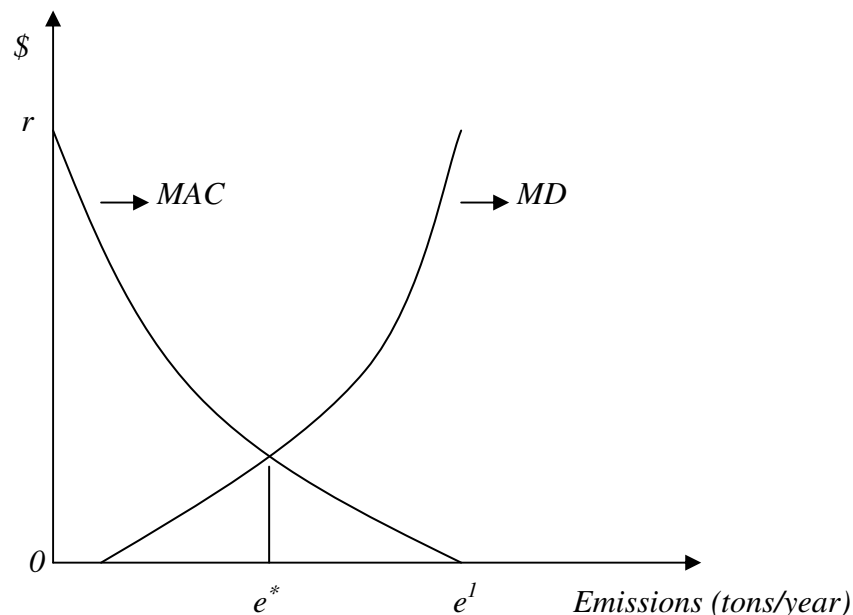


Figure 5.3 Liability and Property Rights

Suppose that emissions initially are at e^1 , country (B) is devoting no resources at all to emissions abatement. At this point marginal damages are $\$r$ and marginal abatement costs are nil. The obvious action for country (A) to do is to offer country (B) some amount of money to reduce its effluent stream; for the first ton any amount agreed on between 0 and $\$r$ would make both parties better off. In fact, they would continue to bargain as long as marginal damages exceeded marginal abatement costs. This bargaining process would result in a reduction in effluent to e^* , the point at which marginal damages and marginal abatement costs are equal.

On the other hand, if country (A) has the same right of use given previously to country (B), in this case the emission level would be zero or very close to it (point e^1). So country (B) would have to buy permission from country (A) to dump its wastes. Any price for this, lower than marginal abatement costs but higher than marginal damages would make both parties better off. Similar process of bargaining with payments now going in the opposite direction, the emission level would be adjusted from the low level where it started toward the efficient level e^* .

If property rights over the environmental asset are clearly defined, and bargaining among “owners” and “prospective users” is allowed, the efficient level of effluent will result irrespective of who was initially given the property right.

By defining private property rights, the conditions under which decentralized bargaining can produce efficient levels of environmental quality, can be established. Because some will say that the parties doing bargaining may know more about the relative values involved (abatement costs and damages), and the true efficiency point may be reached at the end. Also, no need to have some “bureaucratic organization” making decisions, based mostly on political considerations, instead of the true economic values involved.

In order for a property rights approach to be effective, three main conditions should be met:

- Property rights must be well defined, enforceable, and transferable;
- There must be a reasonably efficient and competitive system for interested parties to come together and negotiate about how these environmental property rights will be used;
- There must be a complete set of markets so that private owners may capture all social values associated with the use of an environmental asset.

Finally it is important to mention that the efficient use of the River depends on negotiations and agreement between the two countries. In this sample we assume that, transactions costs, which are negotiations costs together with the costs of policing the agreement, are expected to be fairly modest. As transactions costs are low, both countries should be able to negotiate on the efficient level of emissions. The question that arises is:

- When transactions costs are high, can this seriously reduce the potential of the private property approach to identify the efficient level of emissions?

Annex 8: Water in the Bible

European Christian Environmental Network, (2007)

<http://www.africanwater.org/religion.htm>

Old Testament

Because the Bible was written in a part of the world where water is scarce it is not surprising that water features significantly in the lives of the people. The scarceness of water was very serious and drought was often as a result of the **wrath of God**. The prophets Elijah, Jeremiah and Haggai all predict drought as punishment from God (1 Kings 17:1, Jeremiah 14: 1-6 and Haggai 1: 10-11 respectively). Conversely rainfall is a sign of God's favour and goodness.

Water was often associated with **danger and death**, as in the story of the Great Flood, the drowning of the Egyptians in the Red Sea and the fear of the sea and deep waters expressed by the Psalmists as in Psalm 32:6-

For this shall every one that is godly pray unto thee in a time when thou mayest be found: surely in the floods of great waters they shall not come nigh unto him.

Polluted and undrinkable water was also very serious. One of the plagues of Egypt was turning the waters of the Nile River to blood (Exodus 7:14-24). When the Israelites left the Red Sea and came to Marah they found the water there bitter and complained to Moses. God allowed Moses to perform the miracle of making the water sweet and restored the Israelites faith in Him (Exodus 15:22-27).

In **warfare** it was common practice to cut off a city's water supply as Jehosaphat did with the wells of Moab (2 Kings 3:19-25).

Water was also important for **cleansing**. Priests were washed at their consecration (Exodus 29:4) special ablutions were demanded for priests on the Day of Atonement (Leviticus 16:4, 24, 26) and of all men for the removal of ceremonial pollution (Leviticus 11:40, 15:15, Deuteronomy 23:11 etc).

Water is also symbolic of God's **blessing** and **spiritual refreshment** and is used many times in the Bible. The following are just a few examples:

Isaiah 35:6-7

...for in the wilderness shall waters break out, and streams in the desert.
And the parched ground shall become a pool, and the thirsty land springs of water...

Isaiah 41:17-18

When the poor and needy seek water, and there is none, and their tongue faileth for thirst, I the LORD will hear them, I the God of Israel will not forsake them. I will open rivers in high places, and fountains in the midst of the valleys: I will make the wilderness a pool of water, and the dry land springs of water.

The longing for water indicates **spiritual need** as in Psalm 42:1-

As the hart panteth after the water brooks, so panteth my soul after thee, O God.

In Ezekial's vision of God's house the waters that poured from under the threshold represent the unrestricted flow of God's **blessings** upon his people (Ezekiel 47:1-12).

Jeremiah describes **God** as "the fountain of living waters" (Jeremiah 2:13, 17:13).

New Testament

In the New Testament water is connected with the gift of **eternal life**. Some examples are

John 4:14

But whosoever drinketh of the water that I shall give him shall never thirst; but the water that I shall give him shall be in him a well of water springing up into everlasting life.

Revelation 21:6

...I am Alpha and Omega, the beginning and the end. I will give unto him that is athirst of the fountain of the water of life freely.

The story of Jesus and the Samaritan woman

John 4: 1-42

(King James Version, the Holy Bible. Christ's words are in Italics)

¹When therefore the LORD knew how the Pharisees had heard that Jesus made and baptized more disciples than John, ²(though Jesus himself baptized not, but his disciples,) ³he left Judaea, and departed again into Galilee.

⁴And he must (needs) go through Samaria. ⁵Then cometh he to a city of Samaria, which is called Sychar, near to the parcel of ground that Jacob gave to his son Joseph. ⁶Now Jacob's well was there. Jesus therefore, being wearied with his journey, sat thus on the well: and it was about the sixth hour.

⁷There cometh a woman of Samaria to draw water: Jesus saith unto her, “*Give me to drink*” ⁸(for his disciples were gone away unto the city to buy meat.)

⁹Then saith the woman of Samaria unto him, “How is it that thou, being a Jew, askest drink of me, which am a woman of Samaria?” (For the Jews have no dealings with the Samaritans.)

¹⁰Jesus answered and said unto her, “If thou knewest the gift of God, and who it is that saith to thee, Give me to drink; thou wouldest have asked of him, and he would have given thee living water.”

¹¹The woman saith unto him, “Sir, thou hast nothing to draw with, and the well is deep: from whence then hast thou that living water? ¹²Art thou greater than our father Jacob, which gave us the well, and drank thereof himself, and his children, and his cattle?”

¹³Jesus answered and said unto her, “Whosoever drinketh of this water shall thirst again: ¹⁴but whosoever drinketh of the water that I shall give him shall never thirst; but the water that I shall give him shall be in him a well of water springing up into everlasting life.”

¹⁵The woman saith unto him, “Sir, give me this water, that I thirst not, neither come hither to draw.”

¹⁶Jesus saith unto her, “Go, call thy husband, and come hither.”

¹⁷The woman answered and said, “I have no husband.” Jesus said unto her, “Thou hast well said, I have no husband: ¹⁸for thou hast had five husbands; and he whom thou now hast is not thy husband: in that saidst thou truly.”

¹⁹The woman saith unto him, “Sir, I perceive that thou art a prophet. ²⁰Our fathers worshipped in this mountain; and ye say, that in Jerusalem is the place where men ought to worship.”

²¹Jesus saith unto her, “Woman, believe me, the hour cometh, when ye shall neither in this mountain, nor yet at Jerusalem, worship the Father. ²²Ye worship ye know not what: we know what we worship: for salvation is of the Jews. ²³But the hour cometh, and now is, when the true worshippers shall worship the Father in spirit and in truth: for the Father seeketh such to worship him. ²⁴God is a Spirit: and they that worship him must worship him in spirit and in truth.”

²⁵The woman saith unto him, “I know that Messiah cometh, which is called Christ: when he is come, he will tell us all things.”

²⁶Jesus saith unto her, "*I that speak unto thee am he.*"

²⁷And upon this came his disciples, and marvelled that he talked with the woman: yet no man said, "What seekest thou?" or, "Why talkest thou with her?"

²⁸The woman then left her waterpot, and went her way into the city, and saith to the men, ²⁹"Come, see a man, which told me all things that ever I did: is not this the Christ?" ³⁰Then they went out of the city, and came unto him.

³¹In the mean while his disciples prayed him, saying, "Master, eat."

³²But he said unto them, "I have meat to eat that ye know not of."

³³Therefore said the disciples one to another, "Hath any man brought him ought to eat?"

³⁴Jesus saith unto them, "My meat is to do the will of him that sent me, and to finish his work. ³⁵Say not ye, There are yet four months, and then cometh harvest? behold, I say unto you, Lift up your eyes, and look on the fields; for they are white already to harvest. ³⁶And he that reapeth receiveth wages, and gathereth fruit unto life eternal: that both he that soweth and he that reapeth may rejoice together. ³⁷And herein is that saying true, One soweth, and another reapeth. ³⁸I sent you to reap that whereon ye bestowed no labour: other men laboured, and ye are entered into their labours."

³⁹And many of the Samaritans of that city believed on him for the saying of the woman, which testified, "He told me all that ever I did." ⁴⁰So when the Samaritans were come unto him, they besought him that he would tarry with them: and he abode there two days. ⁴¹And many more believed because of his own word;

⁴²And said unto the woman, "Now we believe, not because of thy saying: for we have heard him ourselves, and know that this is indeed the Christ, the Saviour of the world.")

**Annex 9: EU Rapid Reaction Mechanism – End of programme report
Lebanon/Israel Wazzani springs dispute**

European Commission Conflict Prevention and Crisis Management Unit, January 2004. www.unispal.un.org/.../6d44261ed50b1a0e85256e51006a826e?OpenDocument

Summary

This report is submitted to the Council pursuant to article 9 of Council Regulation (EC) 381/2001 of 26 February 2001 establishing the Rapid Reaction Mechanism.

The Commission sent an expert team under the Rapid Reaction Mechanism (RRM) to Lebanon and Israel in October 2002 as part of a concerted international response to rising tensions between Israel and Lebanon over the construction of a pumping station at the Wazzani springs. The team was sent in response to an appeal by the Lebanon and the UN for assistance in resolving the dispute. It was tasked with providing an objective assessment of the technical data upon which a mediated settlement of the dispute could be built.

The Wazzani springs rise in Lebanon close to the Blue Line. Their waters feed the Hasbani river - a tributary of the Jordan, one of Israel's main water sources. Israel objected to the construction of the pumping station without prior consultation, while Hezbollah threatened retaliation to any Israeli attack on the plant.

The study team (to which the French authorities seconded an expert at the request of the Commission) delivered its report in July 2003 (as reported to Member States at the time). It provides a technical overview of the water resources of the whole Hasbani basin. The study also identifies the parameters affecting future development of the water resources in the basin. In the absence of an agreed framework for mediation of the dispute the report has not yet been released, though Israel, Lebanon, the US and the UN have been briefed on its key findings. The report has been delivered to the EU Special Representative on the Middle East Peace Process who is expected to raise the issue on his forthcoming tour to the region in January 2004.

Background

The water resources of the Hasbani basin became a source of mounting tension between Lebanon and Israel in August 2002 when Lebanon announced the

construction of a new pumping station at the Wazzani springs. The springs feed the Hasbani river, which rises in the south of Lebanon and crosses the frontier ('Blue Line') to feed the Jordan and subsequently the Sea of Galilee, which is used as Israel's main reservoir.

The pumping station was completed in October 2002. Its purpose was to provide drinking water and irrigation to some sixty villages on the Lebanese side of the Blue line. An existing pumping station supplied a small population on the Israeli side of the line. October 2002 also marked the high point of tension between Israel and Lebanon, with a real risk of armed conflict over the station. The Israelis complained about the lack of prior consultation whereas the Lebanese contended that the project was consistent with the 1955 Johnston Plan on the water resources of the region 2.

The EU and US both sent envoys to the region in late 2002 in response to the rising tensions. The UN also indicated that it was prepared to offer its good offices to the parties and co-ordinated international offers of assistance. On 13 October, the Lebanese Prime Minister invited the EC to provide technical assistance to establish objective baseline information on the water resources of the disputed area. The EC Rapid Reaction Mechanism assessment team arrived in the region two days later, and prepared a preliminary appraisal of the situation as a first contribution within the framework UN co-ordinated response.

Objectives of the programme

The overall objective of the project was to contribute to the reduction of tension between Israel and Lebanon over the sharing of the water resources of the Wazzani springs and the Hasbani river.

The project's specific objective was to provide objective information on volumes of water being extracted from the springs and the Hasbani river and to offer a technical overview of the parameters affecting the usage of the water resources of the Hasbani basin.

Outputs

The study team provided the following outputs:

- A hydrological impact assessment of the Wazzani pumping station;

- An assessment of water needs for the area served by the Wazzani pumping station and a preliminary assessment of the technical options for meeting these needs.
- Identification of the parameters affecting the use of water resources in the wider Hasbani basin, including their possible impact on downstream water users.

Management of the programmes and follow-up

The study was designed in close consultation with the office of the EU Special Representative and the UN Special Representative for South Lebanon, Stefan de Mistura. The secondment of a hydrologist from the French Ministry of Foreign Affairs proved valuable in ensuring a coherent EU approach to the technical issues underlining the dispute.

The study was been conducted in close collaboration with the Lebanese authorities and in consultation with Israel (which, however, declined to provide any data). The exercise has been co-ordinated with the UN at high level in New York.

Monitoring, Reporting and Evaluation

The programme was monitored by the EC Delegations in Beirut and Tel Aviv. Regular briefings have been given to the EU Special Representative (EUSR) and his staff, the Political and Security Committee, the Council working group on the Middle East Peace Process and the Water Task Force (most recently at its meeting of 16 December 2003). The Commission has ensured regular communication with the US State Department and the UN both at field and headquarters level.

Financial Summary

<i>Programme Ref</i>	RRM 2002-03 Policy Advice and Mediation Facility
<i>Financing Decision</i>	C(2002)1245
<i>Start Date of project</i>	16/10/2002
<i>End Date of project</i>	16/04/2003
<i>Project amount</i>	€86,500
<i>OECD DAC Code</i>	14010 Water resources policy and administrative management

Assessment of Impact

The final report of the RRM team was accepted in June 2003 and a summary of its findings communicated to Member States. Regrettably the mediation process to which the study was intended to contribute has not yet materialised, with the Israelis insisting that the US act as guarantors of its interests in such a process, whereas Lebanon is seeking a UN framework. The UN is ready to provide its good offices to the parties to the dispute but is not prepared to mediate between intermediaries.

It was agreed in discussions with the EUSR and the Council that an early public release of the Wazzani study in the absence of a political process for the resolution of the dispute would undermine its value. However, the Commission has provided oral briefings on the main findings of the study to the Lebanese Prime Minister, the Israeli Ministry of Foreign Affairs, the UN and the US State Department.

The dispute remains unresolved. Nevertheless, it is clear that the concerted international response to the crisis on the Israel–Lebanon border sparked by the Wazzani pumping station was effective in reducing tension in the area and avoiding a military engagement. The Wazzani study contributed an important practical element to the international response, and was effective in strengthening the role of the EU in the dispute in a number of distinct ways:

- It provided concrete demonstration of the effective engagement of the international community in the dispute;
- It contributed to ensuring continued international scrutiny of the issue throughout the six months of the study period;
- It ensured the EU Prime Ministerial level access on the issue in Lebanon;
- It provided a non-political channel of contact with the Israeli side, which eventually led to an official Israeli demarche and non-paper on 2 February 2003;
- It provided an opportunity for reinforced co-operation with the United States, resulting in regular briefing sessions with State Department officials.

The issue remains on the agenda, though good Winter rains are expected to take the edge off the dispute for the time being (as was the case in Winter 2002/3). It is expected to be raised by EUSR Otte during his January visit to the region. The

Commission has indicated that it will seek the advice of the EUSR and Member States before releasing the full study.

European Commission
Brussels, January 2004

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**Annex 10: The Dublin Statement on Water and Sustainable Development
Dublín, Ireland, January 31, 1992**

www.un-documents.net/h2o-dub.htm, www.sawse.org/Helpus.html

<http://www.wiserearth.org/resource/view/50a7c9f5d1b56d7fd82d1fbc06ba4e6b>

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Introduction

Scarcity and misuse of fresh water pose a serious and growing threat to sustainable development and protection of the environment. Human health and welfare, food security, industrial development and the ecosystems on which they depend, are all at risk, unless water and land resources are managed more effectively in the present decade and beyond than they have been in the past.

Five hundred participants, including government-designated experts from a hundred countries and representatives of eighty international, intergovernmental and non-governmental organizations attended the International Conference on Water and the Environment (ICWE) in Dublin, Ireland, on January 26-31, 1992. The experts saw the emerging global water resources picture as critical. At its closing session, the Conference adopted this Dublin Statement and the Conference Report. The problems highlighted are not speculative in nature; nor are they likely to affect our planet only in the distant future. They are here and they affect humanity now. The future survival of many millions of people demands immediate and effective action.

The Conference participants call for fundamental new approaches to the assessment, development, and management of freshwater resources, which can only be brought about through political commitment and involvement from the highest levels of government to the smallest communities. Commitment will need to be backed by substantial and immediate investments, public awareness campaigns, legislative and institutional changes, technology development, and capacity building programmes. Underlying all these must be a greater recognition of the interdependence of all peoples, and of their place in the natural world.

In commending this Dublin Statement to the world leaders assembled at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in June 1992, the Conference participants urge all governments to study carefully the specific activities and means of implementation recommended in the Conference Report, and to translate those recommendations into urgent action programmes for water and sustainable development.

Guiding Principles

Concerted action is needed to reverse the present trends of overconsumption, pollution, and rising threats from drought and floods. The Conference Report sets out recommendations for action at local, national, and international levels, based on four guiding principles.

Principle No. 1 - Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment

Since water sustains life, effective management of water resources demands a holistic approach, linking social and economic development with protection of

natural ecosystems. Effective management links land and water uses across the whole of a catchment area or groundwater aquifer.

Principle No. 2 - Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels

The participatory approach involves raising awareness of the importance of water among policymakers and the general public. It means that decisions are taken at the lowest appropriate level, with full public consultation and involvement of users in the planning and implementation of water projects.

Principle No. 3 - Women play a central part in the provision, management and safeguarding of water

This pivotal role of women as providers and users of water and guardians of the living environment has seldom been reflected in institutional arrangements for the development and management of water resources. Acceptance and implementation of this principle requires positive policies to address women's specific needs and to equip and empower women to participate at all levels in water resources programmes, including decision-making and implementation, in ways defined by them.

Principle No. 4 - Water has an economic value in all its competing uses and should be recognized as an economic good

Within this principle, it is vital to recognize first the basic right of all human beings to have access to clean water and sanitation at an affordable price. Past failure to recognize the economic value of water has led to wasteful and environmentally damaging uses of the resource.

Managing water as an economic good is an important way of achieving efficient and equitable use, and of encouraging conservation and protection of water resources.

The Action Agenda

Based on these four guiding principles, the Conference participants developed recommendations which enable countries to tackle their water resources

problems on a wide range of fronts. The major benefits to come from implementation of the Dublin recommendations will be:

Alleviation of poverty and disease

At the start of the 1990s, more than a quarter of the world's population still lack the basic human needs of enough food to eat, a clean water supply and hygienic means of sanitation. The Conference recommends that priority be given in water resources development and management to the accelerated provision of food, water and sanitation to these unserved millions.

Protection against natural disasters

Lack of preparedness, often aggravated by lack of data, means that droughts and floods take a huge toll in deaths, misery and economic loss. Economic losses from natural disasters, including floods and droughts, increased three-fold between the 1960s and the 1980s.

Development is being set back for years in some developing countries, because investments have not been made in basic data collection and disaster preparedness. Projected climate change and rising sea levels will intensify the risk for some, while also threatening the apparent security of existing water resources. Damages and loss of life from floods and droughts can be drastically reduced by the disaster preparedness actions recommended in the Dublin Conference Report.

Water conservation and reuse

Current patterns of water use involve excessive waste. There is great scope for water savings in agriculture, in industry and in domestic water supplies. Irrigated agriculture accounts for about 80% of water withdrawals in the world. In many irrigation schemes, up to 60% of this water is lost on its way from the source to the plant. More efficient irrigation practices will lead to substantial freshwater savings.

Recycling could reduce the consumption of many industrial consumers by 50% or more, with the additional benefit of reduced pollution. Application of the "polluter pays" principle and realistic water pricing will encourage conservation and reuse. On average, 36% of the water produced by urban water utilities in developing countries is "unaccounted for". Better management could reduce these costly losses.

Combined savings in agriculture, industry, and domestic water supplies could significantly defer investment in costly new water-resource development and have enormous impact on the sustainability of future supplies. More savings will come from multiple use of water. Compliance with effective discharge standards, based on new water protection objectives, will enable successive downstream consumers to reuse water which presently is too contaminated after the first use.

Sustainable urban development

The sustainability of urban growth is threatened by curtailment of the copious supplies of cheap water, as a result of the depletion and degradation caused by past profligacy. After a generation or more of excessive water use and reckless discharge of municipal and industrial wastes, the situation in the majority of the world's major cities is appalling and getting worse. As water scarcity and pollution force development of ever more distant sources, marginal costs of meeting fresh demands are growing rapidly. Future guaranteed supplies must be based on appropriate water charges and discharge controls. Residual contamination of land and water can no longer be seen as a reasonable trade-off for the jobs and prosperity brought by industrial growth.

Agricultural production and rural water supply

Achieving food security is a high priority in many countries, and agriculture must not only provide food for rising populations, but also save water for other uses. The challenge is to develop and apply water-saving technology and management methods, and through capacity building, enables communities to introduce institutions and incentives for the rural population to adopt new approaches, for both rainfed and irrigated agriculture. The rural population must also have better access to a potable water supply and to sanitation services. It is an immense task, but not an impossible one, provided appropriate policies and programmes are adopted at all levels--local, national and international.

Protecting aquatic ecosystems

Water is a vital part of the environment and a home for many forms of life on which the well-being of humans ultimately depends. Disruption of flows has reduced the productivity of many such ecosystems, devastated fisheries, agriculture and

grazing, and marginalized the rural communities which rely on these. Various kinds of pollution, including transboundary pollution, exacerbate these problems, degrade water supplies, require more expensive water treatment, destroy aquatic fauna, and deny recreation opportunities. Integrated management of river basins provides the opportunity to safeguard aquatic ecosystems, and make their benefits available to society on a sustainable basis.

Resolving water conflicts

The most appropriate geographical entity for the planning and management of water resources is the river basin, including surface and groundwater. Ideally, the effective integrated planning and development of transboundary river or lake basins has similar institutional requirements to a basin entirely within one country. The essential function of existing international basin organizations is one of reconciling and harmonizing the interests of riparian countries, monitoring water quantity and quality, development of concerted action programmes, exchange of information, and enforcing agreements.

In the coming decades, management of international watersheds will greatly increase in importance. A high priority should therefore be given to the preparation and implementation of integrated management plans, endorsed by all affected governments and backed by international agreements.

The enabling environment

Implementation of action programmes for water and sustainable development will require a substantial investment, not only in the capital projects concerned, but, crucially, in building the capacity of people and institutions to plan and implement those projects.

The knowledge base

Measurements of components of the water cycle, in quantity and quality, and of other characteristics of the environment affecting water are an essential basis for undertaking effective water management. Research and analysis techniques, applied on an interdisciplinary basis, permit the understanding of these data and their application to many uses.

With the threat of global warming due to increasing greenhouse gas concentrations in the atmosphere, the need for measurements and data exchange on the hydrological cycle on a global scale is evident. The data are required to understand both the world's climate system and the potential impacts on water resources of climate change and sea level rise. All countries must participate and, where necessary, be assisted to take part in the global monitoring, the study of the effects and the development of appropriate response strategies.

Capacity building

All actions identified in the Dublin Conference Report require well-trained and qualified personnel. Countries should identify, as part of national development plans, training needs for water resources assessment and management, and take steps internally and, if necessary with technical co-operation agencies, to provide the required training, and working conditions which help to retain the trained personnel.

Governments must also assess their capacity to equip their water and other specialists to implement the full range of activities for integrated water-resources management. This requires provision of an enabling environment in terms of institutional and legal arrangements, including those for effective water-demand management.

Awareness rising is a vital part of a participatory approach to water resources management. Information, education and communication support programmes must be an integral part of the development process.

Follow-Up

Experience has shown that progress towards implementing the actions and achieving the goals of water programmes requires follow-up mechanisms for periodic assessments at national and international levels. In the framework of the follow-up procedures developed by UNCED for Agenda 21, all Governments should initiate periodic assessments of progress. At the international level, United Nations institutions concerned with water should be strengthened to undertake the assessment and follow-up process. In addition, to involve private institutions, regional and non-governmental organizations along with all interested governments in the assessment and follow-up, the Conference proposes, for consideration by UNCED, a world water forum or council to which all such groups could adhere.

It is proposed that the first full assessment on implementation of the recommended programme should be undertaken by the year 2000.

UNCED is urged to consider the financial requirements for water-related programmes, in accordance with the above principles, in the funding for implementation of Agenda 21. Such considerations must include realistic targets for the timeframe for implementation of the programmes, the internal and external resources needed, and the means of mobilizing these.

The International Conference on Water and the Environment began with a Water Ceremony in which children from all parts of the world made a moving plea to the assembled experts to play their part in preserving precious water resources for future generations.

In transmitting this Dublin Statement to a world audience, the Conference participants urge all those involved in the development and management of our water resources to allow the message of those children to direct their future actions.

Appendix 2

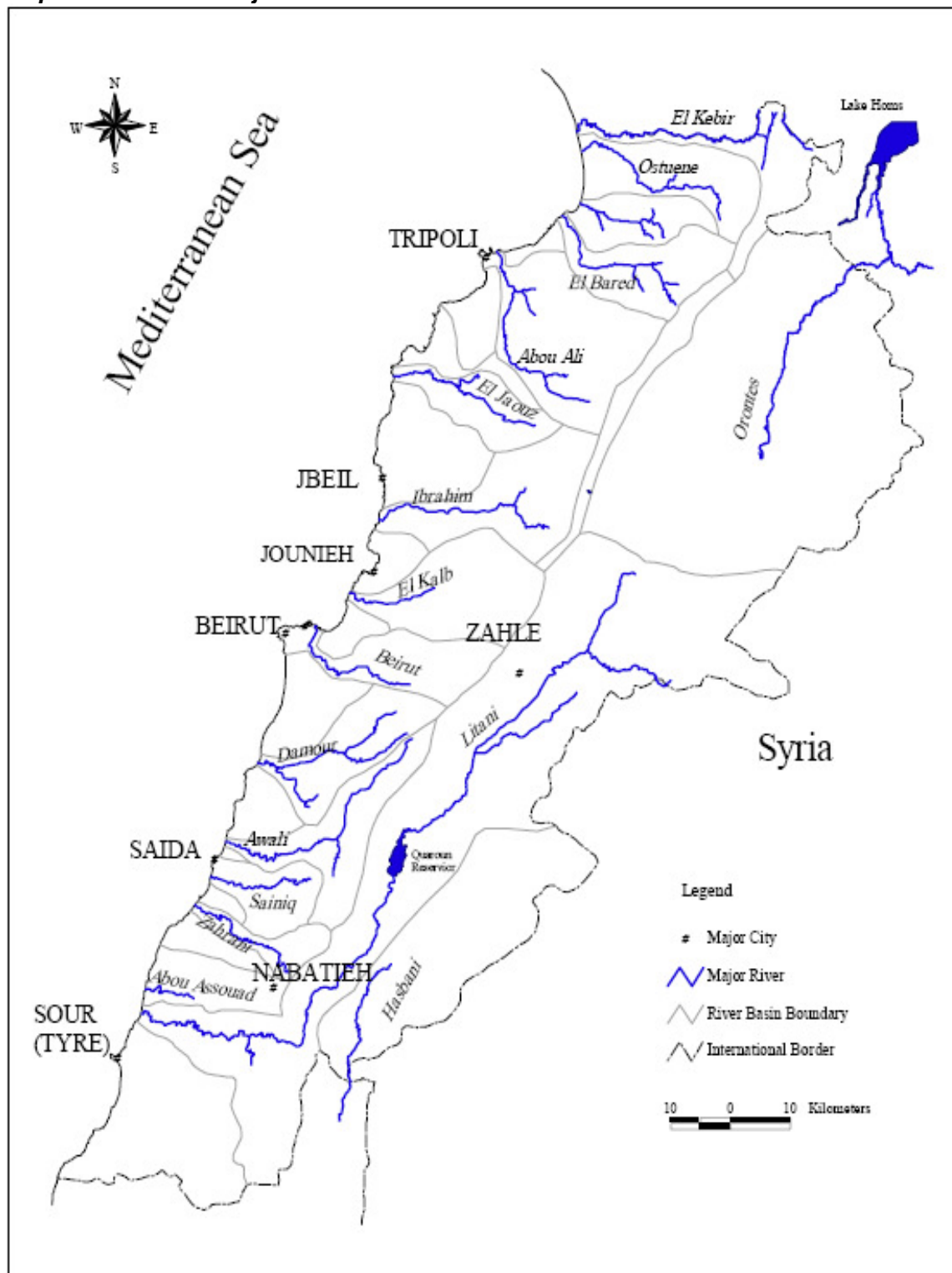
Annex 1: Maps

Map 1: The State of Israel



Source: Wikipedia. December 31, 2006.

Map 2: Lebanon's Major River Basins



Source: ECODIT 2001, Lebanon State of the Environment Report, P: 114.

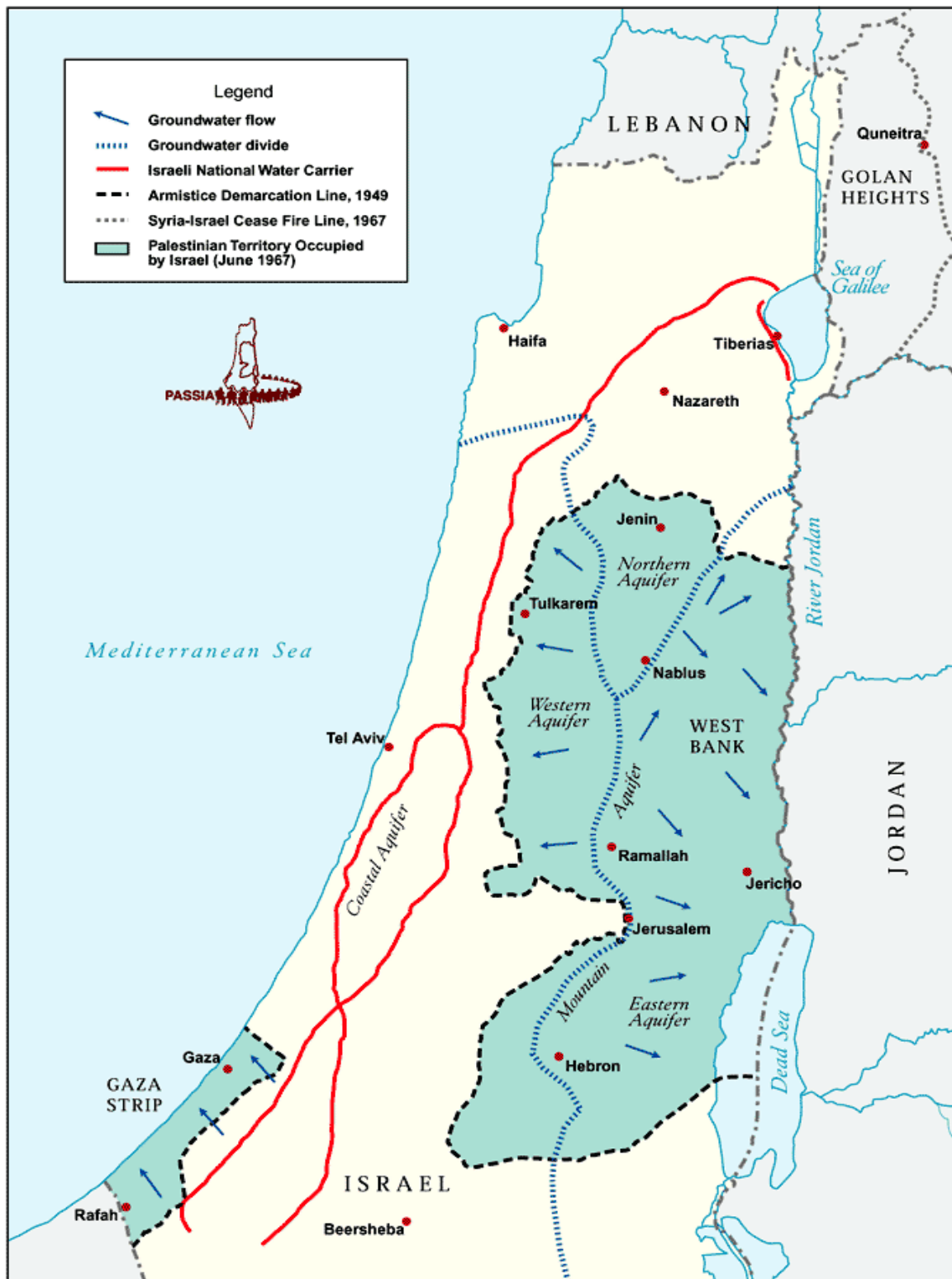
Map 3: The Jordan River Basin



Source: Adapted from the Johnston Plan (Passia.org 2007)

Map 4: Israel Freshwater Resources

Water Sources



Adapted from: 'Water and War in the Middle East' Info Paper no.5, July 1996, Centre for Policy Analysis on Palestine/ The Jerusalem Fund, Washington D.C.

Palestinian Academic Society for the Study of International Affairs (PASSIA)

**Annex 2: Zionist Organization Statement on Palestine
Paris Peace Conference (February 3, 1919)**

PROPOSALS PRESENTED TO THE PEACE CONFERENCE

The Zionist Organization respectfully submits the following draft resolutions for the consideration of the Peace Conference:

1. The High Contracting Parties recognize the historic title of the Jewish people to Palestine and the right of Jews to reconstitute in Palestine their National Home.
2. The boundaries of Palestine shall be as declared in the Schedule annexed hereto.
3. The sovereign possession of Palestine shall be vested in the League of Nations and the Government entrusted to Great Britain as Mandatory of the League.
4. (Provision to be inserted relating to the application in Palestine of such of the general conditions attached to mandates as are suitable to the case.)
5. The mandate shall be subject also to the following special conditions:
 1. Palestine shall be placed under such political, administrative and economic conditions as will secure the establishment there of the Jewish National Home, and ultimately render possible the creation of an autonomous Commonwealth, it being clearly understood that nothing shall be done which may prejudice the civil and religious rights of existing non-Jewish communities in Palestine or the rights and political status enjoyed by Jews in any other country.

To this end the Mandatory Power shall inter alia:

1. Promote Jewish settlement and close settlement on the land, the established rights of the present non-Jewish population being equitably safeguarded.
2. Accept the co-operation in such measures of a Council representative of the Jews in Palestine and of the world that may be established for the development of the Jewish National Home in Palestine and entrust the organization of Jewish education to such Council.
3. On being satisfied that the constitution of such Council precludes the making of private profit, offer to the Council in priority any concession for public

works or for the development of natural sources which may be found desirable to grant:

1. The Mandatory Power shall encourage the widest measure of self-government for localities practicable in the conditions of the country.
2. There shall be forever the fullest freedom of religious worship for all creeds in Palestine. There shall be no discrimination among the inhabitants with regard to citizenship and civil rights, on the grounds of religion, or of race.
3. (Provision to be inserted relating to the control of the Holy Places.)

THE BOUNDARIES OF PALESTINE

SCHEDULE

The boundaries of Palestine shall follow the general lines set out below: Starting on the North at a point on the Mediterranean Sea in the vicinity south of Sidon and following the watersheds of the foothills of the Lebanon as far as Jisr El-Karaon thence to El-Bire, following the dividing line between the two basins of the Wadi El-Korn and the Wadi Et-Teim, thence in a southerly direction following the dividing line between the Eastern and Western slopes of the Hermon, to the vicinity west of Beit Jenn, then eastward following the northern watersheds of the Nahr Mughaniye close to and west of the Hedjaz Railway.

In the east a line close to and west of the Hedjaz Railway terminating in the Gulf of Akaba;

In the south a frontier to be agreed upon with the Egyptian Government;

In the west the Mediterranean Sea.

The details of the delimitations, or any necessary adjustments of detail, shall be settled by a Special Commission on which there shall be Jewish representation.

STATEMENT

THE HISTORICAL TITLE

The claims of the Jews with regard to Palestine rest upon the following main considerations:

1. The land is the historic home of the Jews; there they achieved their greatest development; from the centre, through their agency, there emanated spiritual and moral influences of supreme value to mankind. By violence they were

driven from Palestine, and through the ages they have never ceased to cherish the longing and the hope of a return.

2. In some parts of the world, and particularly in Eastern Europe, the conditions of life of millions of Jews are deplorable. Forming often a congested population, denied the opportunities which would make a healthy development possible, the need of fresh outlets is urgent, both for their own sake and the interests of the population of other races, among whom they dwell. Palestine would offer one such outlet. To the Jewish masses it is the country above all others in which they would most wish to cast their lot. By the methods of economic development to which we shall refer later, Palestine can be made now, as it was in ancient times, the home of a prosperous population many times as numerous as that which now inhabits it.

3. Palestine is not large enough to contain more than a proportion of the Jews of the world. The greater part of the fourteen millions or more scattered throughout all countries must remain in their present localities, and it will doubtless be one of the cares of the Peace Conference to ensnare for them, wherever they have been oppressed, as for all peoples, equal rights and humane conditions. A Jewish National Home in Palestine will, however, be of high value to them also. Its influence will permeate the Jewries of the world, it will inspire these millions, hitherto often despairing, with a new hope; it will hold out before their eyes a higher standard; it will help to make them even more useful citizens in the lands in which they dwell.

4. Such a Palestine would be of value also to the world at large, whose real wealth consists in the healthy diversities of its civilizations.

5. Lastly, the land itself needs redemption. Much of it is left desolate. Its present condition is a standing reproach. Two things are necessary for that redemption -- a stable and enlightened Government, and an addition to the present population which shall be energetic, intelligent, devoted to the country, and backed by the large financial resources that are indispensable for development. Such a population the Jews alone can supply.

Inspired by these ideas, Jewish activities, particularly during the last thirty years, have been directed to Palestine within the measure that the Turkish administrative system allowed. Some millions of pounds sterling have been spent in the country, particularly in the foundation of agricultural settlements. These settlements have been, for the most part, highly successful.

With enterprise and skill the Jews have adopted modern scientific methods and have shown themselves to be capable agriculturalists. Hebrew has been revived as a living language; it is the medium of instruction in the schools and the tongue is in daily use among the rising generation. The foundations of a Jewish University have been laid at Jerusalem and considerable funds have been contributed for the creation of its building and for its endowment. Since the British occupation the Zionist Organization has expended in Palestine approximately =A3 50,000 a month upon relief, education and sanitation. To promote the future development of the country, great sums will be needed for drainage, irrigation, roads, railways, harbors and public works of all kinds, as well as for land settlement and house building. Assuming a political settlement under which the establishment of a Jewish National Home in Palestine is assured, the Jews of the world will make every effort to provide the vast sums of money that will be needed.

Hundreds of thousands of Jews pray for the opportunity speedily to begin life anew in Palestine. Messengers have gone out from many places, and groups of young Jewish men proceeding on foot have already reached Trieste and Rome on their weary pilgrimage to Zion.

The historic title of the Jews to Palestine was recognized by the British Government in its Declaration of November 2nd, 1917, addressed by the British Secretary of State for Foreign Affairs to Lord Rothschild, and reading as follows: "His Majesty's Government view with favour the establishment in Palestine of a National Home for the Jewish people, and will use their best endeavors to facilitate the achievement of this objective, it being clear that nothing shall be done which may prejudice the civil and religious rights of existing non-Jewish communities in Palestine or the rights and political status enjoyed by Jews in any other country." The French Government gave its support to the British Declaration to M. Sokolow as follows:

Ministre des Affaires Etrangres de la
Republique Francaise
Le 14 Fevrier, 1918
Monsieur,

"Comme il avait convenu au cours de notre entretien le samedi 9 de ce mois, le Gouvernement de la Republique, en vue de preciser son attitude

vis-a-vis de aspirations sionistes, tendant por les juifs en Palestine un foyer national, a publi un communique dans la Presse.

"En vous communiquant ce texte, je saisis avec empressement l'occasion de vous feliciter du gereux devouement avec lequel vous poursuivez la realisation des voeux de vos coreligionnaires et de voux remercier du zeile que vous apportez el leur faire connaitre les sentiments de sympathie que leurs efforts eveillent dans les pays de le Entente et notamment en France.

"Veuillez agreer, Monsieur, les assurances de ma consideration tres distinguee.

(Sgd.) S. Pichon
Monsieur Sokolow,
tel Meurice
Paris.

[Enclosure]

Paris, Le 9 de Fevrier, 1918.

"Monsieur Sokolow representant des organisations Sionistes, a et reu ce matin, au Ministere des Affaires Etrangeres, par M. Stephen Pichon, qui a heuraux de lui conformer que l'entente est complete entre les gouvernements francaise et britannique en ce qui concerne la question dun etablissement juif en Palestine.

The Italian Government has declared its approval on the same lines. The President of the United States has expressed his sympathy with the Zionist aspirations in the spirit of Mr. Balfour's declaration. The Governments of Japan, Greece, Serbia, China, and Siam have added their approval to the declaration.

Great Britain as Mandatory of the League of Nations

We ask that Great Britain shall act as Mandatory of the League of Nations for Palestine. The selection of Great Britain as Mandatory is urged on the ground that this is the wish of the Jews of the world, and the League of Nations in selecting a Mandatory will follow as far as possible the popular wish of the people concerned. The Preference on the part of the Jews for a British Trusteeship is unquestionably the result of the peculiar relationship of England to the Jewish Palestinian problem. The return of the Jews to Zion has not only been a remarkable feature in English literature, but in the domain of statecraft it has played its part, beginning with the readmission of the Jews under Cromwell. It manifested itself particularly in the nineteenth century in the instructions given to British Consular representatives in the

Orient after the Damascus [Blood Libel] incident; in the various Jewish Palestinian projects suggested by English non-Jews prior to 1881; in the letters of endorsement and support given by members of the Royal Family and Officers of the Government to Lawrence Oliphant; and, finally, in the three consecutive acts which definitely associated Great Britain with Zionism in the minds of the Jews, viz: the El-Arish offer in 1901; the East African offer in 1903, and, lastly, the British Declaration in favour of a Jewish National Home in Palestine in 1917. Moreover, the Jews who have gained political experience in many lands under a great variety of governmental systems, whole-heartedly appreciate the advanced and liberal policies adopted by Great Britain in her modern colonial administration.

It may be stated without doubt that all of these things account for the attitude taken by the Jews with reference to the Trusteeship, as evidenced by the following: On December 16th, 1918, the American Jewish Congress composed of delegates representing 3,000,000 American Jews adopted the following resolution:

"The American Jewish Congress instruct their delegation to Europe to co-operate with representatives of other Jewish Organizations and specifically with the World Zionist Organization, to the end that the Peace Conference may recognize the aspirations and historic claims of the Jewish people with regard to Palestine, and declare that, in accordance with the British Government's Declaration of November 2nd, 1917, endorsed by the Allied Governments and the President of the United States, there shall be established such political administrative and economic conditions in Palestine, as will assure under the trusteeship of Great Britain, acting on behalf of such League of Nations as may be formed, the development of Palestine into a Jewish Commonwealth; it being clearly understood that nothing shall be done which shall prejudice the civil and religious rights of existing non-Jewish communities in Palestine, or the rights and political status enjoyed by Jews in other countries."

Similar action was taken in Jaffa in the month of December, 1918, by a conference of representatives of the Jewish population in Palestine, and on January 4th, 1919, by Jewish Congresses representing about two million Jews of the reconstituted States of Austria-Hungary and of Poland.

BOUNDARIES

The boundaries above outlined are what we consider essential for the necessary economic foundation of the country. Palestine must have its natural outlets to the seas and the control of its rivers and their headwaters. The boundaries are sketched with the general economic needs and historic traditions of the country in mind, factors which necessarily must also be considered by the Special Commission in fixing the definite boundary lines. This Commission will bear in mind that it is highly desirable, in the interests of economical administration, that the geographical area of Palestine should be as large as possible, so that it may eventually contain a large and thriving population which could more easily bear the burdens of modern civilized government than a small country with a necessary limitation of inhabitants.

The economic life of Palestine, like that of every other semi-arid country, depends on the available water supply. It is, therefore, of vital importance not only to secure all water resources already feeding the country, but also to be able to conserve and control them at their sources.

The Hermon is Palestine's real "Father of Waters," and cannot be severed from it without striking at the very root of its economic life. The Hermon not only need re-forestation but also other work before it can again adequately serve as the water reservoir of the country. It must, therefore, be wholly under the control of those who will most willingly as well as most adequately restore it to its maximum utility. Some international arrangement must be made whereby the riparian rights of the people dwelling south of the Litani River may be fully protected. Properly cared for, these headwaters can be made to serve in the development of the Lebanon as well as of Palestine.

The fertile plains east of the Jordan, since the earliest Biblical times, have been linked economically and politically with the land west of the Jordan. The country which is now very sparsely populated, in Roman times supported a great population. It could now serve admirably for colonization on a large scale. A just regard for the economic needs of Palestine and Arabia demands that free access to the Hedjaz Railway throughout its length be accorded both Governments.

An intensive development of the agriculture and other opportunities of Trans-Jordania make it imperative that Palestine shall have access to the Red Sea and an opportunity of developing good harbours on the Gulf of Akaba. Akaba, it will be

recalled, was the terminus of an important trade route of Palestine from the days of Solomon onwards. The ports developed in the Gulf of Akaba should be free ports through which the commerce of the Hinterland may pass on the same principle which guides us in suggesting that free access be given to the Hedjaz Railway.

PROPOSALS TO THE MANDATORY POWER

In connection with the Government to be set up by the Mandatory of the League of Nations until such time as the people of Palestine shall be prepared to undertake the establishment of representative and responsible Government, proposals will be made in due course to the Mandatory Power to the following effect:

1. In any instrument establishing the constitution of Palestine the Declarations of the Peace Conference shall be recited as forming an integral part of that constitution.

2. The Jewish people shall be entitled to fair representation in the executive and legislative bodies in the selection of public and civil servants. In giving such representation the Mandatory Power shall consult the Jewish Council hereinafter mentioned.

Neither law nor custom shall preclude the appointment of a citizen of Palestine as chief of the Executive.

1. That in encouraging the self-government of localities the Mandatory Power shall secure the maintenance by local communities of proper standards of administration in matters of education, communal or regional activities. In granting or enlarging local autonomy regard shall be had to readiness and ability of the community to attain such standards. Local autonomous communities shall be empowered and encouraged to combine and co-operate for common purposes.

2. Education without distinction of race shall be assisted from public funds.

3. Hebrew shall be one of the official languages of Palestine and shall be employed in all documents, decrees, and announcements and on all stamps, coins and notes issued by the Government.

4. The Jewish Sabbath and Holy Days shall be recognized as legal days of rest.

5. All inhabitants continuing to reside in Palestine who on the day of , 19 , have their domicile in Palestine, except those who elect in writing within six months from such date to retain their foreign citizenship, shall become citizens of Palestine,

and they and all persons in Palestine or naturalized under the laws of Palestine after the day of , 19 , shall be citizens thereof and entitled to the protection of the Mandatory Power on behalf of the Government of Palestine.

Land Commission

Recognizing that the general progress of Palestine must begin with the reform of the conditions governing land tenure and settlement, the Mandatory Power shall appoint a Commission (upon which the Jewish Council shall have representation) with power:

1. To make a survey of the land and to schedule all lands that may be made available for close settlement, intensive cultivation, and public use.

2. To propose measures for determining and registering titles of ownership of land.

3. To propose measures for supervising transactions in land with a view of preventing land speculation.

4. To propose measures for the close settlement, intensive cultivation, and public use of land, where necessary by compulsory purchase at a fair pre-war price and further, by making available all waste lands unoccupied and inadequately cultivated lands or lands without legal owners and state lands.

5. To propose measures for the taxation and the tenure of land and in general any progressive measures in harmony with the policy of making the land available for close settlement and intensive cultivation.

6. To propose measures whereby the Jewish Council may take over all lands available for close settlement and intensive cultivation.

7. In all such measures the established rights of the present population shall be equitably safeguarded.

THE JEWISH COUNCIL FOR PALESTINE

1. A Jewish Council for Palestine shall be elected by a Jewish Congress representative of the Jews of Palestine and of the world, which shall be convoked in Jerusalem on or before January 1st, 1920, or as soon thereafter as possible by the Provisional Jewish Council hereinafter mentioned.

The Jewish Congress shall determine its function as well as constitution and functions of the Jewish Council in conformity with the purpose and spirit of the Declarations of the Peace Conference and of the powers conferred by the Mandatory Power upon the Jewish Council.

2. The Jewish Council shall be recognized as a legal entity and shall have power:

1. To co-operate and consult with and to assist the Government of Palestine in any and all matters affecting the Jewish people in Palestine and in all such cases to be and to act as the representative of the Jewish people.
2. To participate in the development and administration of immigration, close land settlement, credit facilities, public work, services and enterprises, and every other form of activity conducive to the development the country. The organization of Jewish education to be entrusted to such Council.
3. To acquire and hold real estate.
4. To acquire and exercise concessions for public works and the development of natural resources.
5. With the consent of the Jewish inhabitants concerned or their accredited representatives, to assess such inhabitants for the purpose of stimulating and maintaining education, communal, charitable and other public institutions (including the Jewish Council), and other activities primarily concerned with the welfare of the Jewish people in Palestine.
6. With the approval of the Mandatory Power and upon such terms and conditions as the Mandatory Power may prescribe, to administer the immigration laws of Palestine in so far as they affect the Jewish immigration.
7. With the approval of the Mandatory Power, to issue bonds, debentures, or other obligations, the proceeds of any or all of which to be expended by the Jewish Council for the benefit of the Jewish people or for the development of Palestine.
8. The Jewish Council shall hold all of its property and income in trust for the benefit of the Jewish people.

3. A Provisional Jewish Council of representatives of the Zionist Organization, of the Jewish population in Palestine, and of such other approved Jewish organizations as are willing to co-operate in the development of a Jewish Palestine shall be formed forthwith by the Zionist Organization. Such Provisional Jewish Council shall exercise all of the powers and perform all of the duties of the Jewish Council until such time as the Jewish Council shall be formally constituted by the Jewish Congress.

4. Finally, when in the opinion of the Mandatory Power, the inhabitants of Palestine shall be able to undertake the establishment of a representative and responsible government, such steps shall be taken as will permit the establishment of such government through the exercise of a democratic franchise without regard to race or faith; and the inhabitants of Palestine under such government shall continue to enjoy equal civil and political rights as citizens irrespective of race or faith.

THE ZIONIST ORGANIZATION

The foregoing proposals with reference to Palestine are submitted to the Peace Conference by the Zionist Organization. The Organization in the present form dates from the year 1897, when the first Zionist Congress was held at Basle, Switzerland, under the leadership of Theodore Herzl. This Organization absorbed at that time all Zionist Organizations which had been in existence previously. The Zionist Movement is supported by Jews in every country where there are Jewish mass settlements, i.e., in Eastern Europe, the United States of America, in Western Europe, in all the British Colonies, in the Argentine, in Siberia, in Shanghai, in Morocco, and in Tunis. Zionist federations actively engaged in furthering the principles for which the movement stands are to be found in all these countries. The supreme body which controls the activities of the organizations in the different countries consist of delegates elected by the various local Shekel payers (poll tax) by a democratic franchise, and this body meets biennially.

Through the several financial agencies which the Zionist Congress has created to enable it to carry forward its work in Palestine, the Organization and associated bodies have raised and have expended in Palestine since its inception; millions of pounds. Notwithstanding the fact that since 1913 no meetings of the Congress have been held, the Organization has greatly increased its enrolled membership, and has the support of hundreds of thousands of Jews who sympathize with aims of the movement, and contribute to its funds. Since the war, the centres of political activity have been transferred to London and the United States of America. In the allied countries the conduct of the political activities of the Organization has been entrusted to Dr. [Chaim Weizmann](#) and M. [Nahum Sokolow](#), members of the Executive. In the United States of America the Provisional Executive Committee for General Zionist Affairs, created at the outbreak of the war, has been replaced by the Zionist Organization of America, the Honorary President of which is [Louis D. Brandeis](#), Associate Justice of the Supreme Court of the United States. Zionists are

to be found at the head of all the greater Jewish national institutions which depend upon mass opinion for moral and financial support; and in addition, take a prominent part in all the Jewish National Councils established in the new states in Eastern Europe.

CONCLUSION

In every part of the world on the Day of Atonement the Jews pray that "all nations may be united by a common bond, so that the will of God may reign supreme throughout the world." In the fulfillment of this prayer, the Jews hope that they will be able to take an honorable place in the new community of nations. It is their purpose to establish in Palestine a government dedicated to social and national justice; a government that shall be guided, like the community of old, by that justice and equality which is expressed in the great precept of our Lawgiver: "There shall be but one law for you and the stranger in the land."

All of which is respectfully submitted.

Rothschild (Lord Walter Rothschild)

On behalf of the Zionist Organization,

[Nahum Sokolow](#),

[Chaim Weizmann](#).

On behalf of Zionist Organization of America,

Julian W. Mack.

Stephen S. Wise

Harry Friedenwald.

Jacob De Haas.

Mary Fels.

Louis Robison.

Bernard Flexner.

On behalf of the Russian Zionist Organization

Israel Rosoff.

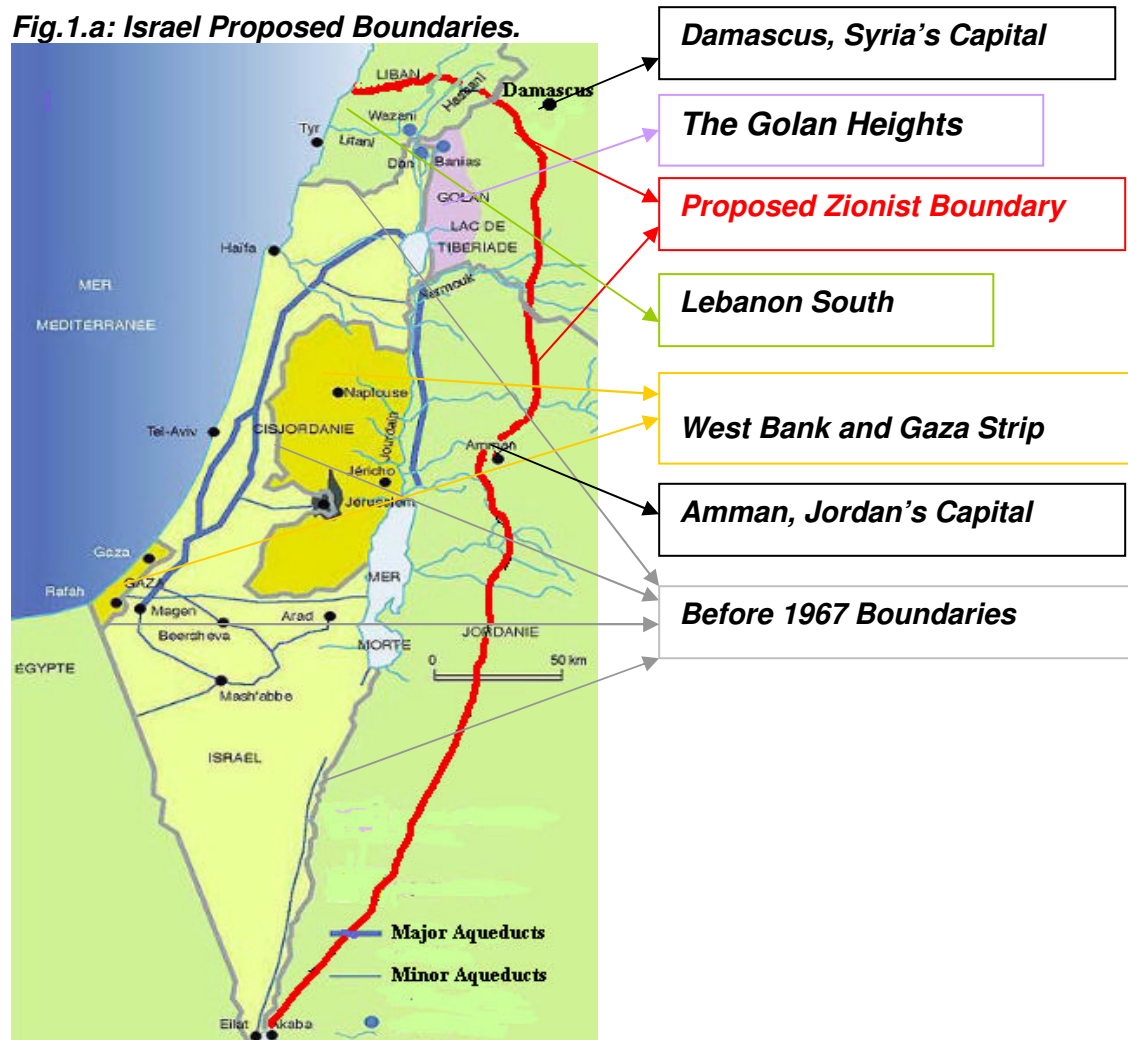
On behalf of the Jewish Population of Palestine in accordance with Mandate received,

[Nahum Sokolow](#)

[Chaim Weizmann](#)

Even before the establishment of the Israeli state, water played a key role in the Zionist colonization of Palestine. As early as 1919, Chaim Weizmann, campaigning for the “minimum requirements essential to the realization of the Jewish National Home” in Palestine, wrote to the British Prime Minister Lloyd George (then):

Fig.1.a: Israel Proposed Boundaries.



Sources: - Jewish proposal for Jewish Homeland, 1919. From the Proposals Presented by the Zionist Organisation to the Paris Peace Conference (1919)
 - Boundary: Mark Tessler, “A History of the Israeli-Palestinian Conflict”, Indiana University Press, Bloomington (1994)
www.eretzyisroel.org/~samuel/parispeace.html (2007)

The boundaries, of the Jewish Home, cannot be drawn exclusively on historic - biblical lines ... Our claims to the north are imperatively demanded by the requirements of modern economic life . . . The whole economic future of Palestine is dependent on its water supply for irrigation and for electric power, and the water supply must mainly be derived from the slopes of mount Hermon, from the headwaters of the Jordan and from the Litany River in Lebanon ... We consider it

essential that the National Frontier of Palestine should include the Valley of the Litany, for a distance of about 25 miles above the bend, and the Western and Southern slopes of Mount Hermon.

As figure 1.a shows, the borders Weizmann was proposing covered not only all of present-day Israel and the occupied territories of the Gaza Strip, the West Bank, and the Golan Heights, but also significant portions of Lebanon, Syria and Jordan.

Fig 1.b: United Nations Partition Plan for Palestine on 29 November 1947.



Source: www.eretzyisroel.org/~samuel/parispeace.html (2007)

b) On 29 November 1947 the **United Nations Partition Plan for Palestine** or **United Nations General Assembly Resolution 181**, a plan to resolve the Arab-Israeli conflict in the British Mandate of Palestine, was approved by the United Nations General Assembly. Increased anti-Semitism in Europe, which had been on

the rise since the late 19th century, led to a greater Jewish influx following the war. The plan would have partitioned the territory of Palestine into Jewish and Arab states, with the Greater Jerusalem area, encompassing Bethlehem, coming under international control.

The British proposed a Palestine divided between a Jewish and an Arab State, but in time changed their position and sought to limit Jewish immigration from Europe to a minimum. This was seen by the Zionists and their sympathisers as betrayal of the terms of the mandate, especially in light of the increasing persecution in Europe. It was met with a popular uprising and guerilla war from Jewish militant groups, often viewed as one of several factors that forced the British to hand the problem of Palestine over to the United Nations. The failure of the British government and the United Nations to implement this plan, prior agreement between the Jewish Agency and King Abdullah to divide Palestine between them, and rejection of the plan by the Arabs resulted in the War for Independence, also known as the 1948 Arab-Israeli War.

According to recent studies by Israeli historians, Zionist acceptance of the United Nations Partition Plan was merely a tactical decision aimed at preventing the establishment of a Palestinian state, leaving open the possibility of further Zionist expansion onto land designated by the United Nations for the new Palestinian state. Thus, when the much expanded State of Israel was declared in 1948, following the 1947-1948 war, no reference was made to the United Nations Partition Plan or to any internationally recognized borders. As David Ben-Gurion explained, "I do not see partition as the final solution of the Palestine question ... after the formation of a large army in the wake of the establishment of the state, we will abolish the partition and expand to the whole of Palestine."

The new Israeli state immediately began work on its water projects. In 1953, construction of the National Water Carrier began according to the basic outline developed under the Lowdermilk-Hayes project. This involved significant diversion of the Jordan River, which Syria protested to the United Nations because it violated the cease fire agreement. The United States considered Israel's moves to be provocative and threatened to cut off aid to Israel, which then stood at \$50 million annually. Israel backed down and instead the Israeli National Water Carrier was supplied with water from Lake Tiberias.

Annex 3: Israel Water Rights (November 30, 1953)

<http://www.jewishvirtuallibrary.org/jsource/History/water.html>

In a review in the Knesset of Israel's foreign relations, Foreign Minister Moshe Sharett devoted the final part of his speech to the dispute concerning Israel's water rights. The relevant parts follow:

“One matter is still pending, namely, the subject of the Security Council deliberations in recent weeks: the future of our work in diverting the Jordan to generate electricity which is also linked to future irrigation plans. I will not enter into details, partly because they have been made public and also because the matter is still under discussion and no decision has yet been taken. In this campaign, too, we have invested much effort. We insist on our right to continue and finish the work we have begun. We disrupted it temporarily in order to allow the Security Council a short spell to clarify the issue in a calm atmosphere, just as previously we were prepared to facilitate the clarification of certain points for the UNTSO Chief of Staff by a short halt in the work. We are certainly interested in renewing the work in full agreement with the UN. The only limitations which we shall be ready to contemplate as justified, in so far as renewing the work is concerned, relate to securing individual rights against any damage. The yard-stick for the sincerity and efficiency of such a guarantee is approval of its sufficiency by an authorized UN institution. We shall not agree to accept the approval of any other body on this matter.

As for the question of regional water planning which has meanwhile arisen, we were the first to have declared our readiness to sit with our three neighbours with whom we have, or may have, common water interests Jordan, Syria and Lebanon to elucidate and determine a regional settlement of water resources on the basis of their just apportionment, and if they so desire, to arrive also at a joint planning of water utilization for irrigation and the supply of energy for the good of all factors concerned. As long as no such settlement is established again, because of the refusal of the neighbouring countries to convene with Israel we shall deem ourselves free and justified to treat the waters of the rivers flowing in our country as our own. It is inconceivable that a ban or delay be imposed on our development work pending the neighbouring countries' consent to cooperate. Such a condition is tantamount to putting the lid on every Israeli development project dependent on utilization of water resources in the north. On the contrary, we are convinced that the uninterrupted

continuation of Israeli development projects is, possibly, the most efficient means for bringing about regional cooperation.

Finally, we are prepared to examine in good faith any regional water plan which may be submitted by any international body. It was in this spirit that we promised to approach, and indeed did so approach the study of a plan proposed some time ago in general outline by the Government of the United States. Our method in the study of such plans will be dual: first, a very careful examination of the assessments and the scientific and technical data upon which the plan is founded, in the light of our vast accumulation of knowledge and experience and on the basis of opinion of experts of international repute whom we trust, secondly, a firm insistence on the full quantity of water and available energy necessary for Israel's economic development and its very Survival. The plan submitted to us is conspicuously faulty from both these aspects, as well as from others. Discussion of the plan is not yet concluded.

All those wishing to win our cooperation in this sphere must realize one thing. For Israel, water is no luxury, not even merely a highly desirable and useful addition to our system of natural resources. Water for us is life itself. It is food for the people and not food alone. Without large scale irrigation projects we shall not achieve high productivity, balancing the economy or economic independence. For without irrigation we shall not at all produce a worthy agriculture under our special circumstances, and without agriculture particularly highly developed and progressive agriculture shall not be a people rooted in the land, secure in its existence, stable in its character, in control of all the possibilities of material and spiritual creation inherent in it and which this country can open before it.”

Annex 4: Historical Reading

Source: Wikipedia, 2008. <http://en.wikipedia.org/wiki/>

a) The **Sea of Galilee** is Israel's largest freshwater lake. It is approximately 53 km (33 miles) in circumference, about 21 km (13 miles) long, and 13 km (8 miles) wide; it has a total area of 166 km², and a maximum depth of approximately 43 m. At 209 m below sea level, it is the lowest freshwater lake on Earth and the second-lowest lake in the world after the Dead Sea, a saltwater lake. It is not a sea by any normal definition; it is called a sea by tradition. The lake is also known on modern maps as **Lake Galilee** or **Lake Tiberias**. The name Galilee refers to the region of Galilee in which it is located. In modern Hebrew it is known by its biblical name, **Yam Kinneret** (ים כנרת), "Sea of Kinnereth" (Numbers 34:11; Joshua 13:27). The name may originate from the Hebrew word *kinnor* ("harp" or "lyre") - which the lake's shape resembles. It has also been called the **Lake of Gennesaret** or the **Sea of Gennesaret** (Luke 5:1) after the name of a small fruitful plain which lies on its western side. The Arabic name for the lake is **Buhairat Tabariyya** (بحيرة طبريا) meaning *Lake Tiberias*. Other names for the Sea of Galilee are **Ginnosar**, **Lake of Gennesar**, **Sea of Chinneroth**, **Sea of Tiberias** (Roman) and **Waters of Gennesaret**.

The Kinneret is fed by underground springs, but its main source is the Jordan River, which flows through it from north to south. The lake is situated deep in the Jordan Great Rift Valley, the valley caused by the separation of the African and Arabian Plates. Consequently the area is subject to earthquakes and, in the past, volcanic activity. This is evidenced by the abundant basalt and other igneous rock that define the geology of the Sea of Galilee region.

Due to its low-lying position in the rift valley, surrounded by hills, the sea is prone to sudden violent storms; hence the New Testament story about Jesus calming the storm. Indeed, the main feature of the lake seems to be its ever-changing character. It is still noted, as in New Testament times, for its rich fish stocks, and in today's restaurants, "St. Peter's Fish" (tilapia) is very popular.

The Sea of Galilee lies on the ancient Via Maris which linked Egypt with the northern empires. The Greeks, Hasmoneans, and Romans founded flourishing towns and settlements here: Gadara, Hippos, Tiberias and others. The first-century historian Flavius Josephus was so impressed by the area that he wrote, "One may

call this place the ambition of Nature.” Josephus also reported a thriving fishing industry at this time, with 230 boats regularly working in the lake.

Much of the ministry of Jesus occurred on the shores of Lake Galilee. In those days, there was a continuous ribbon development of settlements and villages around the lake and plenty of trade and ferrying by boat. The Synoptic gospels of Mark (1:14-20), Matthew (4:18-22), and Luke (5:1-11) describes how Jesus recruited four of his apostles from the shores of Lake Galilee: the fishermen Simon and his brother Andrew and the brothers John and James. One of Jesus’ famous teaching episodes, the Sermon on the Mount, was given on a hill overlooking the lake. Many of his miracles were also recorded to occur here: his walking on water, calming a storm, feeding five thousand people (in Tabgha), and many others.

In 135, the second Jewish revolt against the Romans, called Bar Kokhba’s revolt, was put down. The Romans responded by banning all Jews from Jerusalem. The center of Jewish culture and learning shifted to the region of the Kinneret, particularly the city of Tiberias. It was in this region that the so-called “Jerusalem Talmud” was probably compiled.

In the time of the Byzantine Empire, the lake’s significance in Jesus’ life made it a major destination for Christian pilgrims. This led to the growth of a full-fledged tourist industry, complete with package tours and plenty of comfortable inns.

The lake’s importance declined when the Byzantines lost control of it. The area came under the control of the Umayyad Caliphate and subsequent Islamic empires. Except for Tiberias, the major towns and cities were gradually abandoned. In 1187, Saladin defeated the armies of the Crusades at the Battle of Hattin, largely because he was able to cut the Crusaders off from the valuable fresh water of the Sea of Galilee.

In 1909 Jewish pioneers built their first cooperative farming village (kibbutz), Kvutzat Kinneret which trained Jewish immigrants in farming and agriculture. Later, Kinneret pioneers established Kibbutz Degania. Kinneret was the cradle of the Kibbutz culture of early Zionism and was the birthplace of Naomi Shemer and the burial site of Rachel - two of the most prominent Israeli poets.

In 1923 an agreement between the United Kingdom and France established the border between the British Mandate of Palestine and the French Mandate of Syria. The British handed over the southern Golan Heights to the French in return for the northern Jordan Valley. The border was re-drawn so that both sides of the

Jordan river and the whole of the Sea of Galilee, including a 10-metre wide strip along the northeastern shore, were made a part of Palestine. The 1947 UN Partition Plan put this territory area inside the Jewish state.

During the 1948 Arab-Israeli War, Israel occupied the lake's southwestern shore. This map illustrates the border lines and the Demilitarized Zones at the time the 1949 Armistice Agreements were signed. In 1967, the State of Israel took control of the entire Sea of Galilee as well as the Golan during the Six Day War. Syria still claims the northeastern shore of the sea, arguing it is a part of the Golan Heights, which has been occupied by Israel since 1967.

Israel's National Water Carrier, built in 1964, transports water from the lake to the population centers of Israel, and is the source of most of the country's drinking water. Israel also supplies water from the lake to the West Bank and to Jordan (under the terms of the Israel-Jordan Treaty of Peace). Increasing water demand and some dry winters have resulted in stress on the lake and a decreasing water line, at times to dangerously low levels.

Today, tourism is again the Kinneret's most important economic activity. The entire Sea of Galilee is a popular holiday resort area. The many historical and spiritual sites around the lake, especially its main town Tiberias, are visited by millions of local and foreign tourists annually. Other economic activities include fishing in the lake and agriculture, particularly bananas, in the fertile belt of land surrounding it.

A key attraction is the site where the Kinneret's water flows into the Jordan River. Thousands of pilgrims from all over the world come to be (re-)baptized there every year.

b) The *Hulah Valley* or *Hula Valley* (in Hebrew: עמק החולה, *Emeq ha-Hūlāh*) is an agricultural region in northern Israel with abundant fresh water. It is an important bottleneck site for birds migrating along the Syrian-African Rift Valley between Africa, Europe, and Asia.

Lake Hulah* or *Lake Hula (the Biblical ***Lake Merom***) and its surrounding swamps were drained in the 1950s as an attempt to alter the environment to suit agricultural needs. Though initially perceived as a great national achievement for Israel, with time it became evident that the benefits from transforming the "wasteland" of Lake Hula and its swamps were limited. In the past few years, following nearly 50 years of an unsuccessful struggle to utilize the drained valley's

resources, the Israeli government has finally recognized that successful development can endure only if a balanced compromise between nature and development is reached. Thus, a small section of the former lake and swamp region was recently reflooded in an attempt to prevent further soil deterioration and to revive the nearly extinct ecosystem.

Lake Hula was referred to by many different names: In the 14th century BCE, the Egyptians called the lake - Samchuna. The Tanakh records it as Merom. In the 1st century CE, the Jewish historian Flavius Josephus termed it Semechonitis. In Aramaic the lake was called Hulata or Ulata. In the Talmud it is called Yam Sumchi - i.e. Sea of Sumchi. Currently the lake is called Buheirat el Huleh in Arabic and Agam ha-Hula in Hebrew.

The "Waters of Merom" has sometimes been used erroneously in scientific literature, although that term refers specifically to springs on the western side of the valley.

Prior to its drainage in the 1950s, Lake Hula was 5.3 kilometres long and 4.4 kilometres wide, extending over 12-14 square kilometres. It was about one and a half metres deep in summer and three metres deep in winter.

The lake attracted human settlement from early prehistoric times. Paleolithic archaeological remains were found near the Bnot Yaakov ("Daughters of Jacob") bridge at the southern end of the valley. The first permanent settlements, Enan (Mallaha), dating from 9,000-10,000 years ago was discovered in the valley.

The Hula Valley was a main junction on the important trade route connecting the large commercial centre of Damascus with the eastern Mediterranean coast and Egypt. During the Bronze Age, the cities of Hazor and Layish were built at key locations on this route approximately 4,000 years ago.

At the end of the 13th century BCE, the Israelite tribe of Dan destroyed the city of Layish and built in its place a new city which they named Dan, and for about 400 years, the Israelites ruled over the Hula Valley until it was captured by the Assyrian armies of Tiglath-Pileser III and its inhabitants were driven away. The Bible records the lake "Merom" as the site of a victory of Joshua over the Canaanites. (Josh. 11:5-7).

Throughout the Hellenistic, Roman, Byzantine and early Arab periods (fourth century BCE to eighth centuries CE) rural settlement in the Hula Valley was

uninterrupted. During the Seleucid Empire, a town Seleucia Samulias was founded on the lake.

Traditional crops were rice (as early as the Hellenistic period), cotton and sugar cane (Brought by the Arabs following their conquest in 636), sorghum and maize. Water buffalo were introduced in the eighth century supplying milk and serving as beasts of burden.

The first modern Jewish settlement in the Hula Valley, Yesod Hamaala on the western shore of the lake, was established in 1883 during the first aliyah. In total, by 1948 there were 12 Jewish and 23 Arab settlements in the Hula Valley. Following the establishment of Israel and the 1948 Arab-Israeli War, the Arab inhabitants fled the valley to neighbouring Arab countries.

Numerous kibbutzim, including Kfar Blum, are in the Hula Valley.

c) The Jezreel Valley; Hebrew: יזרעאל עמק, *Emek Yizrael*, also known as the **Plain of Esdraelon** (*Esdraelon* is the Koine Greek rendering of *Jezreel*), and as the **Zirin Valley** (Arabic: سهل زرعين, *Sahel Zir'in*), and as the *Meadow of Amr's son* (*Marj Ibn Amer*, مرج بن عامر), is a large plain and inland valley in the south of the Lower Galilee of Israel, on the northern border of the West Bank. The valley was once the channel by which the Dead Sea (to the southeast of the valley) connected to the Mediterranean Sea; around two million years ago, the land between the Mediterranean Sea and the Great Rift Valley rose to such a degree that this connection was severed, and periodic floods from the Mediterranean Sea were interrupted, resulting in the Dead Sea no longer having an outlet, and becoming heavily saline.

It takes its ancient name from the city of **Jezreel** (known in Arabic as **Zir'in**; زرعين) located on a low hill on the southern edge and overlooking the valley, though some scholars think that the name of the city originated from the name of the clan that founded it, as in their view the Merneptah stele mentions the existence of this clan, not the similarly spelt *Israel*; *Jezreel* means *God sows* or *El sows*. The phrase "valley of Jezreel" was sometimes used to refer to the central part of the valley, around the city of Jezreel, while the southwestern portion was known as the *valley of Megiddo*, after the ancient city of Megiddo, which was located there.

In addition to Jezreel and Megiddo, the valley is the location of a number of other important settlements both ancient and modern. The largest modern settlement in the Jezreel Valley is the city of Afula (Hebrew: עפולה, Arabic: عفولة), also known as

the “Capital of the Valley”; Afula may once have been the Biblical city of Ophrah, which the Book of Judges identifies as the home of Gideon. The valley formed an easier route through the Levant than crossing the mountains on either side, and so saw a large amount of traffic, and was the site of many historic battles; the earliest battle for which there is known to be a surviving detailed account - the Battle of Megiddo - was fought in the valley. Due to the surrounding terrain, Egyptian chariots were only able to travel from Egypt as far as the Jezreel valley and the valley north of Lake Huleh.

According to the Bible, the valley was the scene of a victory by the Israelites, lead by Gideon, against the Midianites, the Amalekites, and the *children of the east*, but was later the location at which the Israelites, lead by king Saul, were defeated by the Philistines; according to textual scholars, the account of a Philistine victory at Jezreel derives from the *monarchial source*, in contrast to the *republican source*, which places the Philistine victory against the Israelites at Gilboa. In Christian Eschatology, the part of the valley on which the Battle of Megiddo was fought is believed to be destined to be the site of a final battle, between good and evil, known as Armageddon (a word derived from *Megiddo*).

Between 1912 and 1925 the Lebanese Sursock family of Beirut (then under the French Mandate of Syria) sold their 80,000 acres of land in the Vale of Esdraelon to the American Zion Commonwealth; the Sursocks had originally purchased the land, in 1872, from the Ottoman government for about £20,000, but American Zion Commonwealth paid them nearly three quarters of a million pounds, and so the Sursocks allegedly “went happily back to Beirut”.

However, the people actually living on the land - 8,000 Palestinian fellahin (landless farmers), in 22 Arab villages - suddenly lost the land they had worked on for the absentee landowners, and although the new owners of the land were compelled to pay compensation in addition to the purchase of the land itself, for the most part they considered themselves evicted following these sales. In some cases, the farmers refused to leave their land, as in Afula (El-Ful), but the new Zionist owners decided that it would be forbidden for fellahins to remain as tenants on land intended for Jewish labour, and they also followed the socialist ideology of the Yishuv, believing that it would be wrong for a (Jewish) landlord to exploit a landless (Arab) peasantry.

As eviction orders increased over the following years, British police had to be used to expel the villagers from their homes. The dispossessed fellahin had to make their way to the coast to search for new work; most ended up in shanty towns on the edges of Jaffa and Haifa. In the 1920s the American Zion Commonwealth founded the modern day city of Afula; the first moshav, Nahalal, was settled in this valley on September 11, 1921.

d) Mount Carmel (Hebrew: *Karem El*, Arabic: *Kurmul/Jabal Mar Elyas*) is a coastal mountain range in northern Israel and the West Bank, stretching from the Mediterranean Sea towards the southeast. Its name literally means *plantation of high quality trees*, roughly equivalent to *the garden*, in reference to the richly fertile character of the hillside. The range was traditionally known as the *vineyards of God*, and archaeologists have discovered ancient wine and oil presses at various locations within the range.

The phrase *Mount Carmel* has been used in three distinct ways:

- To refer to the 24 mile long mountain range, stretching as far in the southeast as Jenin;
- To refer to the northwestern 12 miles of the mountain range;
- To refer to the headland at the northwestern end of the range.

The range is about 4-5 miles wide, sloping gradually towards the southwest, but forming a steep ridge on the northeastern face, 1,742 feet high; the Jezreel Valley lies to the immediate northeast. The range forms a natural barrier in the landscape, just as the Jezreel Valley forms a natural passageway, and consequently the mountain range and the valley had much impact on migration and invasions through the Levant. The mountain formation is an admixture of limestone and flint, containing many caves, and covered in several volcanic rocks.

The sloped side of the mountain is covered with luxuriant vegetation, including oaks, pines, olives, and laurels. Several towns are located on the range, including Yokneam on the eastern ridge, Zikhron Ya'akov on the southern slope, the Druze town of Carmel City (formed in 2003 from the towns of Daliyat al-Karmel and Isfiya) on the more central part of the ridge, and the towns of Nesher, Tirat Hakarmel, and the city of Haifa, on the far northwestern promontory and its base.

From 1930 to 1932, Dorothy Garrod excavated four caves, and a number of rock shelters, in the Carmel mountain range at el-Wad, el-Tabun, and Es Skhul.

Garrod discovered Neanderthal and early modern human remains, including the skeleton of a Neanderthal female, named Tabun I, which is regarded as *one of the most important human fossils ever found*. The excavation at el-Tabun produced the longest stratigraphic record in the region, spanning 600,000 or more years of human activity, from the Lower Paleolithic to the present day, representing roughly a million years of human evolution. There are also several well-preserved burials of Neanderthals and Homo Sapiens Sapiens) and passage from nomadic hunter-gatherer groups to complex, sedentary agricultural societies is extensively documented at the site. Taken together, these emphasize the paramount significance of the Mount Carmel caves for the study of human cultural and biological evolution within the framework of palaeo-ecological changes.

Due to the lush vegetation on the sloped hillside, and many caves on the steeper side, Carmel became the haunt of criminals; Carmel was seen as a place offering an escape from Yahweh, as implied by the Book of Amos. According to the Book of Kings, Elisha travelled to Carmel straight after he had arranged for 42 children to be killed, merely because they had mocked his baldness; this does not necessarily imply that Elisha had sought asylum there from any potential backlash, although the description in the Book of Amos, of the location being a refuge, is dated by textual scholars to be earlier than the accounts of Elisha in the Book of Kings, and according to Strabo it had continued to be a place of refuge until at least the first century.

According to Epiphanius, and Josephus, Mount Carmel had been the stronghold of the Essenes that came from a place in Galilee named *Nazareth*; though this Essene group are sometimes consequently referred to as *Nazareans*, they are not to be confused with the “Nazarene” sect, which followed the teachings of Jesus, but associated with the Pharisees. Members of the modern American groups claiming to be *Essenes*, but viewed by scholars as having no ties to the historical group, treat Mount Carmel as having great religious significance on account of the protection it afforded to the historic Essene group.

During World War I, Mount Carmel played a significant strategic role. The (20th century) Battle of Megiddo took place at the head of a pass through the Carmel Ridge, which overlooks the Valley of Jezreel from the south. General Allenby led the British in the battle, which was the turning point in the war against the Ottoman Empire. The Jezreel Valley had played host to many battles before, including the

very historically significant Battle of Megiddo between the Egyptians and Canaanites, but it was only in the 20th century battle that the Carmel Ridge itself having a significance in the battle, due to the developments in munitions.

In ancient Canaanite culture, *high places* were frequently considered to be sacred, and Mount Carmel appears to have been no exception; Thutmose III lists a *holy headland* among his Palestinian territories, and if this equates to Carmel, as Egyptologists such as Maspero believe, then it would indicate that the mountain headland was considered sacred from at least the 15th century BC. According to the Books of Kings, there was an altar to Yahweh on the mountain, which had fallen into ruin by the time of Ahab, but was rebuilt by Elijah. Iamblichus describes Pythagoras visiting the mountain on account of its reputation for sacredness, stating that it was *the most holy of all mountains, and access was forbidden to many*, while Tacitus states that there was an oracle situated there, which Vespasian visited for a consultation; Tacitus states that there was an altar there, but without any image upon it, and without a temple around it.

In mainstream Jewish, Christian, and Islamic thought, it is Elijah that is indelibly associated with the mountain, and he is regarded as having sometimes resided in a grotto on the mountain. In the Books of Kings, Elijah is described as challenging 450 prophets of a particular *Baal* to a contest at the altar on Mount Carmel to determine whose deity was genuinely in control of the Kingdom of Israel; since the narrative is set during the rule of Ahab and his association with the Phoenicians, biblical scholars suspect that the *Baal* in question was probably Melqart.

According to the biblical account, the challenge was to persuade a deity light a sacrifice by fire, and after the others had failed to achieve this, Elijah poured water on his sacrifice, prostrated himself in prayer, and the fire fell from the sky, and consumed the sacrifice; shortly afterwards, in the account, clouds gather, the sky turns black, and it rains heavily. Scholars think that the account represents a more legendary description of a storm, during which the altar on Mount Carmel was struck by lightning; rather than a prayer for fire, scholars think that the account of Elijah's actions at the altar actually describes a rain-making ritual.

Though there is no biblical reason to assume that the account of Elijah's victory refers to any particular part of Mount Carmel, Islamic tradition places it at a point known as *El-Maharrakah*, meaning *the burning*. In 1958, archaeologists

discovered something on the mountain range that resembled an altar, which they assumed must have been Elijah's altar.

A Catholic religious order was founded on Mount Carmel in the 12th century, named the *Carmelites*, in reference to the mountain range; the founder was a certain *Berthold* (who died at an unknown point after 1185), who was either a pilgrim or crusader. The order was founded at the site that it claimed had once been the location of Elijah's cave, 1700 feet above sea level at the northwestern end of the mountain range; this, perhaps not co-incidentally, is also the highest natural point of the entire mountain range. Though there is no documentary evidence to support it, Carmelite tradition suggests that a community of Jewish hermits had lived at the site from the time of Elijah until the Carmelites were founded there; prefixed to the Carmelite Constitution of 1281 was the claim that from the time when Elijah and Elisha had *dwelt devoutly on Mount Carmel*, priests and prophets, Jewish and Christian, had lived *praiseworthy lives in holy penitence* adjacent to the site of the *fountain of Elisha*, in an uninterrupted succession.

A Carmelite monastery was founded at the site shortly after the order itself was created, and was dedicated to Mary, in the guise of a *sea star* (*stella maris* in Latin) - a common medieval presentation of Mary; although Louis IX (of France) is commonly referred to as the founder, he was not, and had merely visited it in 1252. The Carmelite order grew to be one of the major Catholic religious orders worldwide, although the monastery at Carmel had a less successful history. During the Crusades the monastery frequently changed hands, frequently finding itself to have become a mosque; under Islamic control, the location came to be known as *El-Maharrakah*, meaning *place of burning*, in reference to the account of Elijah's challenge to the priests of Hadad. In 1799 the building was finally converted into a hospital, by Napoleon, but in 1821 the surviving structure was destroyed by the pasha of Damascus. A new monastery was later constructed directly over a nearby cave, after funds were collected by the Carmelite order for restoration of the monastery; the cave, which now forms the crypt of the monastic church, is termed *Elijah's grotto* by the monks.

One of the oldest scapulars is associated with Mount Carmel, and the Carmelites. According to Carmelite legend, the Scapular of Our Lady of Mount Carmel was first given to Simon Stock, an English Carmelite, by Mary, the mother of Jesus; the legend itself, however, is first recorded in a document from 1642, nearly

400 years after the death of Simon Stock. The Carmelites sometimes refer to Mary as *Our Lady of Mount Carmel*, in honour of the legend, and celebrate a feast day dedicated to her in this guise, on the 16 July.

In 1863, the followers of Bábism were exiled from Persia, and in 1868 were transferred to Acre; the corpse of Siyyid `Alí Muḥammad, the founder of Bábism, was transferred from Tehran to the vicinity of Mount Carmel in 1899, and in 1909 the remains were laid to rest within a mausoleum, which had been constructed on the side of Mount Carmel for this purpose. The site thus came to have great importance in Bábism, and its offshoot Bahá'í, and a more elaborate shrine, known as the Shrine of the Báb, was built over the mausoleum in the 1950s, with a series of decorative terraces being constructed around it. Mírzá Ḥusayn-`Alí, the founder of the Bahá'í faith, writing in the *Tablet of Carmel*, designated the area around the shrine as the location for the administrative headquarters of the religion; the Bahá'í administrative buildings were constructed adjacent to the decorative terraces, and are referred to as *the Arc*, on account of their physical arrangement.

e) Beit Shean Valley; (Hebrew: בֵּית שְׁאָן, Bet Šə'an; unofficially also spelled **Beth Shean**; official Israeli Arabic: بيت شان Bayt Šān; Arabic: بيسان **Beesān**, also spelled **Beisan** or **Bisan**) is a city in the North District of Israel.

The modern Israeli city of Beit She'an was founded in 1949, a short time after the establishment of the State of Israel. Beit She'an lies about 120 meters below sea level in the Jordan River Valley, about 60 km south of Tiberias on Highway 90.

Beit She'ans location has often been strategically significant, as it sits at the junction of the Jordan River Valley and the Jezreel Valley, essentially controlling access from the interior to the coast, as well as from Jerusalem to the Galilee. Its name is believed to derive from the early Canaanite "house of the God Shan" or "house of tranquillity."

In 1934, Lawrence of Arabia noted that "Bisan is now a purely Arab village," where "very fine views of the river can be had from the housetops." He further noted that, "Many nomad and Bedouin encampments, distinguished by their black tents, were scattered about the riverine plain, their flocks and herds grazing round them."

Beisan was home to a mainly Mizrahi Jewish community of 95 until 1936, when the 1936–1939 Arab revolt saw Beisan serve as a center of Arab attacks on Jews in Palestine.

In 1938, after learning of the murder of his close friend and Jewish leader Haim Sturmann, Orde Wingate led his men on a rampage in the Arab section of Beit She'an, the rebels' suspected base. Wingate's forces damaged property and wounded several people, some may have been killed.

According to population surveys conducted in British Mandate Palestine, Beisan consisted of 5,080 Muslim Arabs out of a population of 5,540 (92% of the population), with the remainder being listed as Christians. In 1945, the surrounding "Beisan district" consisted of 16,660 Muslims (67%), 7,590 Jews (30%), and 680 Christians (3%), and Arabs owned 44% of land, Jews owned 34%, and 22% constituted public lands. The 1947 UN Partition Plan allocated Beisan and most of its district to the proposed Jewish state.

The first attacks by Jewish militias during the 1948 Arab-Israeli War against Beisan in February and March 1948, part of Operation Gideon, centered on the Bedouin populations of the wider Beisan district, which Walid Khalidi argues was part of a wider Plan Dalet. Joseph Weitz, a leading Zionist figure, wrote in his diary on May 4th 1948 that, "The Beit Shean Valley is the gate for our state in the Galilee... [I]ts clearing are the need of the hour."

Beisan fell to the Jewish militias three days before the end of British Mandate Palestine. After Israel's Declaration of Independence in May 1948, 6,000 Arabs were expelled from Beisan, and their property and communal buildings were confiscated and held by the state of Israel. Many were loaded onto trucks and taken to the Jordanian and Syrian borders where they were forced to cross. Most Palestinian Christians were relocated to Nazareth, including Naim Ateek and his family, who he says left after his father was told by the local Israeli military commander that they would be killed unless they left straightaway. Demolition of homes in Beisan began in June 1948, but was halted to allow Jewish immigrants, largely Ashkenazi, many of them Holocaust survivors, to settle in what remained of the Palestinian homes.

A family of four was held hostage and then killed in 1974 by terrorists from the Palestine Liberation Organization's Popular Democratic Front for the Liberation of Palestine, who took over their apartment building.

Appendix 3

Annex 1 *the Israel-Jordan Negotiations*

<http://www.mfa.gov.il/MFA/Peace%20Process/Guide%20to%20the%20Peace%20Process/Israel-Jordan%20Negotiations>

The bilateral talks between Israel and Jordan, initiated at the Madrid Conference, continued for almost two years in Washington until the signing of the Israeli-Jordanian Common Agenda on September 14, 1993. The Common Agenda constituted the blueprint for the peace treaty, comprising the following components: security, water, refugees and displaced persons, borders and territorial matters.

The first public meeting between King Hussein and Prime Minister Rabin took place in Washington, on July 25, 1994. Out of this meeting emerged The Washington Declaration, signed by Prime Minister Rabin and King Hussein, with President Clinton serving as a witness.

The major achievements of the Washington Declaration were a series of agreements and concrete steps symbolizing the new era:

- The state of belligerency between Jordan and Israel was terminated.
- Both states agreed to seek a just, lasting and comprehensive peace based on UN Resolutions 242 and 338.
- Israel will respect the special role of the Hashemite Kingdom over Muslim holy shrines in Jerusalem.

Concrete steps included the establishment of direct telephone links, joint electricity grids, new border crossings, free access to third country tourists, and cooperation between the police forces in combating crime, with special emphasis on drug smuggling. It was also decided to continue negotiations on bilateral economic cooperation and abolishing economic boycotts, as well as on the opening of an international air corridor between the two countries.

The first meeting in the region of the Israeli and Jordanian bilateral delegations took place on July 18-19, 1994 at Ein Avrona, located in the boundary area north of Aqaba and Eilat. The parties agreed to hold talks on a continuous basis, alternately on the Israeli and Jordanian sides of the border. These talks culminated in the signing of a Treaty of Peace between Israel and Jordan on October 26, 1994.

With the ratification of the peace treaty full diplomatic relations were established between Israel and Jordan on November 27, 1994. Since that time, relations between Israel and Jordan have been steadily progressing. The Jordanian parliament's action in August 1995 to rescind its adherence to the Arab boycott on Israel, as well as the regional economic conference in Amman in November 1995, served as significant positive indicators for the future.

The open border crossings between the two countries have facilitated the normalization of relations. Joint business ventures are being consistently initiated and the free movement of businessmen, by both land and air, has created an atmosphere of cooperation and open communication. Tourism between the two countries has been on the rise.

The basis for the implementation of the peace treaty with Jordan was set with the 15 bilateral agreements which have since been signed and ratified. These agreements cover the following areas: Environmental Protection, Commerce and Trade, Transportation, Air Transport, Water, Agriculture, Combatting Crime and Illicit Drugs, Communications and Mail, Science and Culture, Education, Health, Borders, The Eilat-Aqaba Region, Tourism and Energy. These treaties are to serve as the foundation of the peaceful, normal relationship between Israel and the Hashemite Kingdom.

These are some of the recent highlights of activity:

- *Commerce and Trade*: Since trade began between Jordan and Israel in July 1996, the figures indicate a steady growth in Jordanian-Israeli commerce. In 1996 Israel exported some 9 million dollars' worth of goods to Jordan, while importing products valued at 5 million dollars. In 1997 the value of exports rose to about 20 million dollars, and imports from Jordan amounted to 12.5 million. Estimates for the period January-September 1998 alone show exports and imports at more than 29 million dollars.

- *Economic Cooperation*: An important part of the economic cooperation between Jordan and Israel is taking place in the Hassan Industrial Park in Irbid - the first area to be granted the status of duty-free export to the USA (QIZ). Cooperation in this region is mainly in the areas of textiles and the manufacture of jewelry and electronic equipment. Thousands of Jordanians are employed in these industries, as well as in other industrial areas throughout the country. The success of the joint industrial park in Irbid has given rise to a decision reached by the Ministers of

Industry and Trade of the two countries with regard to the expansion of this move to additional industrial parks in the border area between Jordan and Israel subject to approval by the United States.

- *International Cooperation and Agriculture:* In October 1995 an agreement on cooperation in these areas was signed between Jordan and Israel. Under the terms of this agreement, the Israel Foreign Ministry's Centre for International Cooperation (MASHAV) works together with several government ministries in Jordan and with a number of non-governmental organizations for the promotion of economic and social development for the benefit of both peoples. The two countries have established a joint enterprise for the marketing of agricultural produce, with a view to developing new markets for the agricultural produce being grown in the eastern Jordan River Valley with the help of Israeli technologies.

- *Air Transport:* A "pilot project" has been activated involving the use of Aqaba Airport for flights from Europe bringing tourists to Eilat. With the completion of the new terminal on the Israeli side, all international flights currently landing at Ovda and Eilat Airports will be transferred to the Aqaba-Eilat Peace Airport. Moreover, the number of flights between Amman and Ben-Gurion Airport has been stepped up this year to 14, and a new line has been put in, linking Amman with Haifa twice a week.

- *Tourism:* In 1996, and again in 1997, some 125,000 Israeli tourists visited Jordan. The number of Jordanian tourists visiting Israel came to about 50,000 annually (not counting family visits). There has been an increase in the level of cooperation between the tourist agencies of the two countries in the matter of marketing package tours for Israel and Jordan. There is agreement, too, between the two countries concerning cooperation with the approach of the year 2000 and the expected stream of tourists to the Holy Land from all over the world.

- *Water:* Under the terms of the peace treaty, Israel today provides Jordan with nearly 75 million cubic meters of water per year. Work is to begin soon on the erection of a dam deigned to divert water from the Yarmouk River: another aspect of the cooperation between Jordan and Israel in this domain.

A Trilateral Israel-Jordan-US Economic Committee was established at the October 1993 White House meeting between President Clinton, Crown Prince Hassan and Foreign Minister Peres to discuss economic cooperation and development. This forum first convened in Washington D.C. on November 30, 1993, and then periodically in the region. Sub-groups were established to discuss specific

issues, such as: trade, finance and banking; Jordan Valley cooperative projects; and civil aviation. The outcomes of these talks have been incorporated in the Peace Treaty between Israel and Jordan.

The convening of the fifth meeting of the Trilateral Economic Committee at the Dead Sea Spa Hotel in Jordan on July 20-21, 1994 was the occasion for the first public meeting of Israeli and Jordanian leaders in the region -- Jordanian Prime Minister Majali and Israeli Foreign Minister Peres.

ARTICLE 6: WATER

With the view to achieving a comprehensive and lasting settlement of all the water problems between them:

The Parties agree mutually to recognize the rightful allocations of both of them in Jordan River and Yarmouk River waters and Araba/Arava ground water in accordance with the agreed acceptable principles, which shall be fully respected and complied with.

The Parties, recognizing the necessity to find a practical, just and agreed solution to their water problems and with the view that the subject of water can form the basis for the advancement of co-operation between them, jointly undertake to ensure that the management and development of their water resources do not, in any way, harm the water resources of the other Party.

The Parties recognize that their water resources are not sufficient to meet their needs. More water should be supplied for their use through various methods, including projects of regional and international co-operation.

In light of paragraph 3 of this Article, with the understanding that co-operation in water-related subjects would be to the benefit of both Parties, and will help alleviate their water shortages, and that water issues along their entire boundary must be dealt with in their totality, including the possibility of trans-boundary water transfers, the Parties agree to search for ways to alleviate water shortage and to co-operate in the following fields:

- Development of existing and new water resources, increasing the water availability including co-operation on a regional basis as appropriate and minimising wastage of water resources through the chain of their uses.
- Prevention of contamination of water resources.

- Mutual assistance in the alleviation of water shortages.
- Transfer of information and joint research and development in water-related subjects, and review of the potentials for enhancement of water resources development and use.

**Annex 2: Arab Higher Committee for Palestine Rejects Johnston Plan
(August 18, 1955)**

<http://www.jewishvirtuallibrary.org/jsource/History/ahcrej.html>

While the negotiations conducted by Ambassador Eric Johnston with representatives of Israel and an Arab League Technical Committee were in progress, and an agreement was in sight, the Arab Higher Committee for Palestine, headed by the ex-Mufti of Jerusalem, urged the Arab States to reject the scheme and any project connected with Israel. On 18 August 1955, the Higher Committee sent the following letter to Heads of Arab Governments, Foreign Ministers, the Secretariat General of the Arab League, leaders of political parties and parliamentary blocs:

1. The Arab Higher Committee for Palestine presents to you this letter concerning Mr. Eric Johnston's Scheme. It is enclosing herewith a map and a detailed account of this scheme which aims at the exploitation of the waters of the Arab countries, in the region of the Jordan River Valley, for the benefit of the Zionist cause and of that of the State of Israel. (The Committee) trusts and hopes that this important question will be the object of your care and attention.

Mr. Johnston is still continuing his efforts to carry out his Scheme, known as "The Unified Development of Water Resources in the Jordan Valley Region", and which has been associated with his name because of the talks which he had, in this connection, with the Arab States and with the Jewish authorities in Occupied Palestine.

There are many indications showing very clearly that Mr. Johnston's Scheme is but another step and a wide step made by the imperialists and the Zionists to carry out their programmes and to attain their ends, under the attractive guise of "economic interests" which, they claim, the Arabs in general, and the refugees in particular, will gain from the Scheme.

2. It has been established by conclusive evidence that this scheme has been put forth only to serve Zionist interests, and to provide economic means and factors for sustaining Zionist existence in Palestine, and (securing) its continuity, progress, welfare and territorial expansion in the heart of the Arab homeland.

There is no question but that the most important of these means and factors is "water", which is needed by the Zionists to consolidate their existence and to irrigate

the extensive lands which they have usurped from Palestine but which they cannot cultivate and exploit except by ensuring (the existence of) water especially in the Negev and the southern parts of Palestine.

3. The Zionists had previously put forth a number of schemes to exploit the water resources of the Jordan River Valley foremost among which are the well-known project of Mr. Lowdermilk. They have been trying to control these water resources ever since the British Mandate was imposed on Palestine after the First World War.

The scheme of Unified Development, the subject of the present study, has been meant to fulfil for the Zionists all the water schemes which they put forth many years ago and for the fulfilment of which they have waited for the opportune time.

4. The Zionists admit that their possession of water resources is a fundamental factor in the life of their State and their continued existence. They consider themselves (to be engaged) in a fierce battle with the Arabs, which is the "battle of water".

One of the most conspicuous indications of the importance attached by the Zionists to the water problem is what their Prime Minister Ben-Gurion stated in the course of a speech made by him on 14 May 1955 in Tel Aviv, in commemoration of the establishment of their State. He said: "The Jews are today fighting the Arabs in the 'battle for water'. On the outcome of this battle depends the future of the Jewish existence of Palestine. If we were not to win this battle, it would be as if we had done nothing in Palestine, and we should (then) admit (our) failure."

5. There is no question but that the Johnston Scheme will be the strongest weapon in the hands of the Zionists if they succeed in carrying it out, (and this), despite the objections which they are raising (now) against some aspects of the scheme, and (notwithstanding) the disinterestedness which they are feigning concerning (the scheme) because it (supposedly) does not fulfil their wishes.

There is no doubt that these Zionist allegations are meant only to mislead and deceive the Arabs, in order to make them accept it.

6. The scheme mentioned will realize for the Zionists their ambitions of seizing the (water) resources and exploiting them to irrigate the southern areas and the Negev. For it will make the waters of the tributaries of al-Hasbani, Baniyas, Tall al-Qadi and al-Yarmuk (and all these lie outside Palestine and outside its occupied part), as well as the Jordan River itself, within the reach of the Zionists and subject to

their exploitation for their own interests. This is confirmed by (the fact that) there is (now) a study about the Unified Development Scheme (Johnston's Scheme), showing that the tragedy, to which the tragedy of Andalusia, or indeed any other tragedy which has befallen the Arab nation, cannot (by any means) be comparable.

It is undeniable that the Jewish State, which was established by imperialism and Zionism on the wreckage of the Arabs in Palestine, is dominated by economic crises, by (special) political circumstances, and by party differences which it can hardly stand. (This is) in addition to its being subject to the pressure of the Arab economic blockade. It is as if the advocates of the Johnston Scheme are asking the Arab nation to harness its water resources and wealth to the service of such an aggressive Jewish State and to lend it their support, thereby saving it from its plight and willingly handing over to it their effective weapon which it will use to destroy them in the near future.

For this reason, the Arab Higher Committee considers that the interest of the Arab nation, in general, and that of the Palestine problem and the refugees, in particular, necessitate the outright rejection of the scheme of "The Unified Development of Water Resources in the Jordan River Valley", as well as the rejection of any co-operation concerning it.

The Arab (Higher) Committee is certain that the esteemed Arab States, having made accurate studies of this scheme, share in its opinion regarding the great extent of its danger and the great harm it will bring to Palestine and the neighbouring Arab countries, and consequently, to the whole Arab nation. There is no doubt that the Arabs will lose nothing by rejecting that scheme, for, (by doing so), they will keep their water power for themselves, at a time when the Israelis alone will suffer loss.

If the Western Powers, and America in particular, really intend to help the underdeveloped countries, and to develop (for the Arabs) the water resources in the Arab countries, they should be able to help through schemes specially designed for the Arabs and having no connection with the Zionists.

It is also possible for the Arab countries to undertake purely Arab schemes, beneficial to their countries and peoples, without having to rely for these upon American dollars, with which the foreigners are beckoning in order to attract and entice the Arabs and thus drive them to give their consent to a scheme such as that of Johnston's which in reality aims at the consolidation of the Zionist State, its

development and the enlargement of its territory in the very midst of the Arab homeland.

The Arab Higher Command has attached to this letter a map and a detailed memorandum written after a thorough study in the light of the political and imperialistic aims of Zionism on the dangerous Zionist ambitions over the Arab waters of Syria, Lebanon and Palestine, as well as on "The Unified Development of Water Resources" Scheme. And it urges the Arab States concerned which have any connection with this imperialistic Zionist Scheme to reject it definitively.

(Greetings and Respects)

President of the Arab Higher Committee for Palestine

(Signed) *Muhammed Amin al-Husayni*

Appendix 4

Annex 1: Arab Summit Decides to Divert Jordan River (January 13-17, 1964)

<http://www.jewishvirtuallibrary.org/jsource/History/watsum.html>

The first Arab summit conference, held in Cairo in January 1964 decided, among other things, on the diversion of the headwaters of the River Jordan. The plan itself was only hinted at in the final communiqué issued at the conclusion of the conference, but more details were revealed by the Secretary-General of the Arab League. The final communiqué of the summit reads as follows:

The Council of the Kings and Heads of State of the Arab League, in its first session held at the Arab League Headquarters in Cairo, from 13 to 17 January 1964, upon the suggestion of President Gamal Abdul Nasser, President of the United Arab Republic;

- Having considered the threat and repeated use of force by Israel since it evicted the Palestine Arab population, and created in their territory a colonialist State which practises discrimination against the Arab minority, adopts a policy of aggression of which the fait accompli is the basic feature, flouts continuously the resolutions of the United Nations which affirm the right of the Palestine Arab people to repatriation, and insultingly ignores the many condemnations of it adopted by the United Nations authorities;

- Having discussed Israel's new and aggressive plan to divert the course of the River Jordan, thereby grievously endangering the riparian rights of the Arabs with the object of realizing Zionist designs for expansion through immigration and Israel's plan to establish further centres of aggression against the security and progress of Arab countries, thus endangering world peace;

- In pursuance of the legitimate right of self-defence;

- Fully persuaded of the sacred right of the Palestine Arab people to self determination and liberation from the Zionist colonization of their country, believing that Arab solidarity is the means to off-set imperialist designs, and convinced of the need for the realization of equitable common Arab interests to raise the living standard of the people and to implement programmes for reconstruction and rehabilitation;

- Has therefore adopted the practical resolutions essential to ward off the imminent Zionist menace, whether in the defensive or the technical domains in the field of organizing the Palestinian people to enable them to play their part in the liberation of their country and attain self-determination.

The Council's meeting has brought the Kings and Heads of State to unanimous agreement to put an end to differences, clear the Arab atmosphere of all discord, suspend all campaigns by information media, consolidate relations among the Arab States, ensure collective co-operation and reconstruction and frustrate aggressive expansionist designs menacing all Arab States.

The Council was also of the view that the convening of more of these meetings at the highest level is a matter necessitated by supreme Arab interests, and decided that the Kings and Heads of State should meet at least once a year and that the coming meeting be held during August, 1964, at Alexandria.

The Arab Kings and Heads of State declare that the Arab nation calls upon those nations and peoples of the world which cherish the right to self-determination to extend to it the staunchest support in repelling the new Israeli aggression. These leaders affirm that, in adopting this just and defensive stand, they will regulate their political and economic relations with other countries in accordance with the policy of these countries toward the legitimate Arab struggle against Zionist designs in the Arab world.

The Arab Kings and Heads of State also hope that all those Afro-Asian countries which placed their faith in the Bandung principles and committed themselves to the Addis Ababa Charter and which sacrificed a great deal in fighting imperialism, fought racial discrimination and have been and are still being subjected to the Zionist and imperialist dangers and designs particularly in Africa would extend their true support and assistance to the Arabs in their just struggle.

These leaders also hope for the support of all free nations which believe in peace based on justice.

The Arab Kings and Heads of State further affirm the belief in the justice of the Arab struggle and in the need for supporting this struggle against imperialism in occupied South Yemen and in Oman, as well as their belief in the justice of the national struggle in Angola and South Africa and in every part of the world, that the cause of liberty and justice is integral and indivisible.

The leaders confirm their faith in solving world problems through peaceful means in accordance with the United Nations Charter and affirm their belief in the principle of peaceful co-existence among nations and in the policy of non-alignment. Inspired by this conviction, the Arab countries welcome the partial nuclear test-ban treaty of Moscow and have hastened to sign it. They support the concerted efforts made towards achieving total and complete disarmament in ways that can safeguard world peace.

Inspired by their attachment to the principles of peace based on equity and justice, and their determination to participate in the economic development of the world through the elimination of economic and social under-development, the Arab countries played a major role in the Conference of Economic Development held in Cairo in the spring of 1963. They pledge themselves to participate with the same spirit and determination in the World Conference of Development and Trade which will be held this year.

The Kings and Heads of State welcome the African Unity Charter in which they see a new hope for peace, freedom, and equality in Africa and the world.

Moreover, they affirm their determination to consolidate Afro-Asian co-operation, which began in earnest with the Bandung Conference of 1955. The Arab Kings and Heads of State declare their devotion to their duty towards their Arab nation, towards the dignity of the human family, and in the service of peace and prosperity in the world.

**Annex 2: Israeli Response to Arab League Plan to Divert Jordan
(January 21, 1964)**

<http://www.jewishvirtuallibrary.org/jsource/History/isresp.html>

Israel's reaction to the first Arab summit came in a speech to the Knesset by Prime Minister Levi Eshkol. He declared that Israel would draw water from Lake Kinnereth within the limits established in the Unified Plan. Referring to the Arab threat to divert the headwaters of the Jordan, he added that "Israel will oppose unilateral and illegal measures by the Arab States and will act to protect its vital interests." The text of his statement follows:

Last week thirteen Arab Heads of State and representatives met in Cairo at the invitation of the Egyptian President in order to discuss ways of sabotaging the State of Israel's water plan. At the end of the conference a statement was issued containing attacks and threats against Israel, and reporting the adoption of decisions in both the military and the technical spheres.

Whatever was obscure in the statement was spelled out later by the Secretary-General of the Arab League, who announced the establishment of military, administrative and financial machinery for the execution of what he called "The Arab Plan for the Jordan Waters" which means the diversion of the headwaters of the Jordan to prevent their waters flowing into Israeli territory, with the further purpose of increasing the salinity of the water that will remain.

The deliberation of the conference were held in camera, but before the first session was closed to the public, the President of Egypt managed to reveal the gist of several decisions adopted in 1960 and 1961 by the Council of the Arab League, the League's Defence Council, and the Supreme Council of the Arab General Staffs. These decisions dealt with military and engineering measures designed to prevent the execution of Israel's water plan. The President of Egypt expressly stated that the measures planned in 1960/61 were to have been based on united military operations by the Arab States against Israel.

From the Egyptian President's statement it is clear beyond a shadow of a doubt that if these military and engineering plans to the detriment of Israel's rights and security were not carried out, it was only because the practical conditions required were lacking.

A few days have passed since the conference of the Arab Heads of State broke up, and it is important that the world should be aware of the deplorable significance of the decisions it adopted and the statements it issued. All the States that took part in the conference are members of the United Nations Organization. Under the Charter of the United Nations, it is their duty to refrain not only from the use of force but from any *threat* of force against any other country. Compliance with these principles of the United Nations Charter is humanity's only hope of emerging from the nightmare of war and building a better world founded on justice, law and peace. In recent times the world has become more sensitive to the vital need for a relaxation of world and regional tensions and the avoidance of the danger of armed violence. The aspiration for peace in our time comes from the hearts of all mankind. It is common to all nations and all continents. And it is just in these days that the Heads of the Arab States openly and expressly proclaim that they planned acts of aggression against another State entitled to equal rights in the family of nations, and announce their intention to revive these plans and carry them into effect.

Is it not clear that those who make such proclamations regard the Charter of the United Nations as no more than a worthless scrap of paper? Has it not been demonstrated afresh that the signatures of Egypt and the other Arab countries on the Charter of the United Nations are of no value whatsoever?

We find ourselves confronted with a doctrine of international relations to which there is no parallel in our generation. It is contrary to all law and morality. It makes a mockery of the repeated declarations by the Egyptian President and his colleagues of their devotion to peace and world disarmament. It runs contrary to the mainstream of international thought in our days which has as its central objective the relaxation of tension and the strengthening of peace.

While it is not yet clear what the practical results of the Cairo conference will be, it has already brought out into the clear light of day aggressive and destructive aims that should shock the conscience of every lover of peace. Thirteen Heads of State were moved to assemble and deliberate together. How deplorable it is that the purpose of their meeting was not the social and economic advancement of their tens of millions of people. How horrifying that the only aim that could bring them together under one roof was their lust for aggression against a neighbouring State.

The Cairo conference has laid bare a general posture of hostility to Israel; but the main subject with which it dealt was our country's national water scheme. Here

the conference arrived at a dual conclusion: it painted a distorted picture of our legal and constructive enterprise; and it proclaimed a plan of sabotage, which is based entirely on negation and envy, violation of law and deliberate aggression.

Arab propaganda tries to describe Israel's water project as a unilateral and illegal scheme, which violates the rights of the Arab countries. There is not a grain of truth in this picture. This campaign of distortion deliberately passes over the history of the scheme, its legal basis, and the true facts.

Eleven years ago the Arab States and Israel agreed to the mediation of the President of the United States, who sent the late Ambassador Eric Johnston to this part of the world as his special envoy to work out an agreed regional plan for the utilization of the waters of the Jordan, the Yarmuk and their tributaries. At the opening of the negotiations, the Arab countries on the one hand and Israel on the other submitted separate plans for the allocation of the Jordan and Yarmuk waters. For almost three years Ambassador Johnston conducted parallel and co-ordinated negotiations with the Arab Governments and with Israel.

After prolonged and exhaustive discussions, in which Arab, Israeli and international engineers took part, Mr. Johnston produced a Unified Regional Plan which was based upon accepted rules and principles of international law and procedure. This plan assured Syria and Lebanon of all the quantities of water demanded by them in the Arab plan, without any cuts whatsoever. The Unified Plan allocated to the Kingdom of Jordan all the water required by it for the irrigation of its irrigable areas.

This allocation was based on a detailed, objective survey. In other words, the needs of Jordan, Syria and Lebanon were fully satisfied by the Unified Plan. And indeed, as Ambassador Johnston testified in an article published in the *New York Times* on 10 August 1958, the Arab countries and Israel agreed to the Unified Plan from every point of view connected with its technical and other merits. In October 1955, however, the Arab League decided against ratification of the Plan, not for any reasons pertaining to the quantities of water allocated, but on the deliberate principle of opposing any cooperation even indirect with Israel.

But the three years of negotiation were not in vain. An agreed allocation of water had been determined, which was founded on criteria accepted the world over, and against which the parties concerned had made no objection. And now, in 1964 -

eleven years after the beginning of the negotiations over the Unified Plan, Israel will begin to draw its share of water from Lake Kinnereth in accordance with this Plan.

We have undertaken to remain within the framework of the quantities specified in the Unified Plan and we shall honour this undertaking. According to the principles of international law governing water questions, the refusal of one party to reach agreement with a second party does not give the party that refuses the right to prevent its neighbour drawing its reasonable share from a river flowing through the territories of a number of States. The accepted law pertaining to the allocation of water does not recognize the right of veto or the right to compel the second party to allow its water to run to waste.

Israel will not be the first country to draw water from the Jordan-Yarmuk system. For the past two years the Kingdom of Jordan has been drawing considerable quantities of water from this system in the framework of its Yarmuk Plan. This Plan enjoys the support of international development agencies, which aim at advancing the complete utilization of water resources in every country, in pursuit of the goal of comprehensive regional development. Syria and Lebanon are also drawing all their requirements from the headwaters of the Jordan.

This, then, is the situation: The Arab countries are utilizing the Jordan-Yarmuk system to meet all their needs, while they seek to prevent Israel drawing its share from this network. They believe, apparently, that what is permissible to them should be forbidden to Israel. Their aim is to injure Israel even at the cost of injury to themselves. They wish to convince the world that, in the name of hostility to Israel, they are entitled to prevent the flow of the Jordan headwaters in their natural channels in Israel's territory. I note with satisfaction that the world in general has not been convinced by this theory of hostility and hatred. It is becoming clearer and clearer to the world that the arguments of the Arab countries have nothing to do with water, but are meant to deny Israel's right to exist.

In closing, I wish to clarify the position of the Government of Israel.

Israel will draw water from Lake Kinnereth within the limits of the quantities laid down in the Unified Plan.

Israel will oppose unilateral and illegal measures by the Arab States and will act to protect its vital rights.

We believe that world public opinion will not be misled by malicious misstatements and will reject the campaign of incitements and threats against a

legitimate and constructive development project. This area needs the benefits that will flow from its waters, and not incitement to bloodshed; it needs economic development, not barren strife; cooperation, not envious hostility; the utilization - not the waste - of its water resources; the advancement of peace and not the fomenting of war.

The more firmly world public opinion rejects hostility and aggression, and encourages useful and constructive development, the more it will help the Arab Governments to abandon a policy of reckless adventurism, and will help our area to advance along the road of progress, constructive endeavour and peace.

Appendix 5

Annex 1: NOTE PREPARED BY THE PONTIFICAL COUNCIL FOR JUSTICE AND PEACE

http://www.vatican.va/roman_curia/pontifical_councils/justpeace/documents/rc_pc_justpeace_doc_20030322_kyoto-water_en.html

A CONTRIBUTION OF THE DELEGATION OF THE HOLY SEE ON THE OCCASION OF THE THIRD WORLD WATER FORUM (Kyoto, 16th-23rd March 2003)

PRESENTATION BY H.E. MSGR. RENATO R. MARTINO

On this World Water Day, I have the pleasure of presenting **WATER, AN ESSENTIAL ELEMENT FOR LIFE**: a Note prepared by the Pontifical Council for Justice and Peace as a contribution of the Holy See to the Third World Water Forum, now taking place in Kyoto, Japan. Even the title of the Note reflects the concern of the Holy See, as well as its ethical and religious understanding of the many complex water-related problems. Water is a good that must serve for the development of the whole person and of every person.

After the first section, in which some of the fundamental moral principles related to the question of water are laid out, the Note deals with the key problems which governments and the international community have to face today at the social, economic, political and environmental level. In the final section, after having acknowledged the importance water holds within religious traditions, the Note considers in some detail the *right to water* because of the growing importance that the efforts towards its full recognition is assuming in the public debate.

After the Third World Water Forum, and in the light of its conclusions, the Pontifical Council for Justice and Peace will deal with the topic of water in a more developed and detailed document. The topic is closely related to the message of the Social Doctrine of the Church concerning human promotion and is also an extremely urgent problem in today's world.

Vatican City, 22 March 2003

Archbishop Renato R. Martino

President of the Pontifical Council for Justice and Peace

NOTE: WATER, AN ESSENTIAL ELEMENT FOR LIFE

Introduction

Water is an essential element for life. Many people must confront daily the situation of an inadequate supply of safe water and the very serious resulting consequences. The intention of this paper is to present some of the human, social, economic, ethical and religious factors surrounding the issue of water.

The Holy See offers these reflections on some of the key issues in the agenda of the 3rd World Water Forum (Kyoto, 16th-23rd March 2003), in order to contribute its voice to the call for action to correct the dramatic situation concerning water. The *human being* is the centre of the concern expressed in this paper and the focus of its considerations.

The management of water and sanitation must address the needs of all, and particularly of persons living in poverty. Inadequate access to safe drinking water affects the well being of over one billion persons and more than twice that number have no adequate sanitation. This all too often is the cause of disease, unnecessary suffering, conflicts, poverty and even death. This situation is characterized by countless unacceptable injustices.

I. A FAR-REACHING QUESTION

Water plays a central and critical role in all aspects of life – in the national environment, in our economies, in food security, in production, in politics. Water has indeed a special significance for the great religions.

The inadequacy in the supply and access to water has only recently taken centre stage in global reflection as a serious and threatening phenomenon. Communities and individuals can exist even for substantial periods without many essential goods. The human being, however, can survive only a few days without clean, safe drinking water.

Many people living in poverty, particularly in the developing countries, daily face enormous hardship because water supplies are neither sufficient nor safe. Women bear a disproportionate hardship. For water users living in poverty this is rapidly becoming an issue crucial for life and, in the broad sense of the concept, a *right to life issue*.

Water is a major factor in each of the three pillars of sustainable development – economic, social and environmental. In this framework, it is understood that water must meet the needs of the present population and those of future generations of all societies. This is not solely in the economic realm but in the sphere of integral human development. Water policy, to be sustainable, must promote the good of every person and of the whole person.

Water has a central place in the practices and beliefs of many religions of the world. This significance manifests itself differently in various religions and beliefs. Yet two particular qualities of water underlie its central place in religions: water is a primary building block of life, a creative force; water cleanses by washing away impurities, purifying objects for ritual use as well as making a person clean, externally and spiritually, ready to come into the presence of the focus of worship.

II. THE WATER ISSUE: SOME ETHICAL CONSIDERATIONS

The principle water difficulty today is not one of absolute scarcity, but rather of distribution and resources. Access and deprivation underlie most water decisions. Hence linkages between water policy and ethics increasingly emerge throughout the world.

Respect for life and the dignity of the human person must be the ultimate guiding norm for all development policy, including environmental policy. While never overlooking the need to protect our eco-systems, it is the critical or basic needs of humanity that must be operative in an appropriate prioritisation of water access. Powerful international interests, public and private, must adapt their agendas to serve human needs rather than dominate them.

The human person must be the central point of convergence of all issues pertaining to development, the environment and water. The *centrality of the human person* must thus be foremost in any consideration of the issues of water. The first priority of every country and the international community for sustainable water policy should be to provide access to safe water to those who are deprived of such access at present.

The earth and all that it contains are for the use of every human being and all peoples. This principle of the *universal destination of the goods of creation* confirms that people and countries, including future generations, have the right to fundamental access to those goods which are necessary for their development. Water is such a

common good of humankind. This is the basis for cooperation toward a water policy that gives priority to persons living in poverty and those living in areas endowed with fewer resources. The few, with the means to control, cannot destroy or exhaust this resource, which is destined for the use of all.

People must become the "active subjects" of safe water policies. It is their creativity and capacity for innovation that makes people the driving force toward finding new solutions. It is the human being who has the ability to perceive the needs of others and satisfy them. Water management should be based on a participatory approach, involving users, planners and policy makers at all levels. Both men and women should be involved and have equal voice in managing water resources and sharing of the benefits that come from sustainable water use.

In a globalized world the water concerns of the poor become the concerns of all in a prospective of *solidarity*. This solidarity is a firm and persevering determination to commit oneself to the common good, to the good of all and of each individual. It presupposes the effort for a more just social order and requires a preferential attention to the situation of the poor. The same duty of solidarity that rests on individuals exists also for nations: advanced nations have a very heavy obligation to help the developing people.

The principle of subsidiarity acknowledges that decisions and management responsibilities pertaining to water should take place at the lowest appropriate level. While the water issue is global in scope, it is at the local level where decisive action can best be taken. The engagement of communities at the grassroots level is key to the success of water programs.

III. WATER: A SOCIAL GOOD

While vital to humanity, water has a strong social content. It is highly charged with symbolism and is one of the essentials of life. Among the important social characters of water is its role in human nourishment, health and sanitation as well as peace and conflict avoidance.

Water for Food and Rural Development

Agriculture represents a key sector in the economies of developing countries and cannot be sustained without sufficient water. In most of these countries agricultural activities are a major source of livelihood and an essential dimension of local social cohesion and culture. This activity is carried on by small farmers in rural

areas, very often with huge constraints. However, it must be remembered that, in the end, the dominant use of water around the world will continue to be water for food security.

People living in rural areas, many times in poverty, can be driven by necessity to exploit beyond sustainable limits the little land they have at their disposal. Special training aimed at teaching them how to harmonise the cultivation of land with respect for water and other environmental needs should be encouraged. Where possible, cooperative efforts of water management and use should be encouraged.

Participation suffers when large portions of a population lack skills and knowledge to engage in the issue before them. It should not be overlooked, however, that often those lacking formal education possess traditional forms of knowledge that can be vital and decisive in addressing and solving the question of water. The special knowledge of indigenous people should be esteemed.

In the context of rural development, a shift is needed, however, in the emphasis from the traditional irrigation to other means that focus on the needs of the poor and their food insecurity. The challenges are to develop water-saving technologies and to structure incentives to encourage development.

Lands that have been damaged by waterlogging and salinization must be reclaimed through drainage programs. New irrigation development needs to be carried out with proper environmental impact assessment. Policies must be encouraged that develop sustainable irrigation and harness the wider potential of rainfed farming, incorporating water management for gardens and foods from common property resources.

Safe Drinking Water, Health and Sanitation

Three crucial concerns are present in the relationship between water and health: managing quantity constraints faced by water-poor countries and their impact on human activities; the maintenance of water quality in the face of growing demand; and the direct link between health and water as pertains to diseases.

Management of water quantity can be carried out by revising the allocation of water to different users. Better maintenance and repair of existing water systems can often significantly increase the water supply. Water conservation methods such as rainwater harvesting, fog condensation and underground dams should be studied for use where appropriate along with stabilization ponds for wastewater and treatment technology for the use of wastewater for irrigation.

Water shortages can be substantially overcome through further development and use of treated urban wastewater for use in agriculture. This has considerable potential and if carefully managed carries only very limited risks and associated difficulties.

The problem of maintaining and improving *water quality* is especially acute in the more urbanized areas, predominantly in developing countries. This is most often hampered by a failure to enforce pollution controls at the main point source and the inadequacy of sanitation systems and of garbage collection and disposal.

Most of the *diseases* that contaminate water come from animal or human waste and are communicable. These diseases have health effects that are heavily concentrated in the developing world, and within that context particularly among poor urban populations. Wastewater is often the medium through which these can affect humans.

Whether it relates to quantity, quality or disease, the trend away from centralized government agencies and towards empowering local governments and local communities to manage water supplies must be emphasised. This necessitates building community capacities, especially in the area of personnel, and the allocation of resources to the local level.

Peace and/or Conflict

Growing pressure due to increasing demand for water can be a source of conflict. When water is scarce, competition for limited supplies has led nations to see water as a matter of national or regional security. History provides ample evidence of competition and disputes over shared fresh water resources.

Identifying potential trouble areas does little good if there are no effective and recognized mechanisms for mitigating tensions. Existing international water law may be unable to handle the strains of ongoing and future problems. But some mechanisms for reducing the risks of such conflicts do in fact exist. These need renewed international support and should be applied more effectively and at an earlier stage of potential conflicts.

At the international level, conflicts tend to focus on shared river basins and transboundary waters, especially when combined with circumstances of low water availability. Tensions arise with increasing frequency over projects to dam or divert water by countries in a powerful position upstream from their neighbouring countries.

IV. WATER: AN ECONOMIC GOOD

Water has always been acknowledged for its role in production and thus in the economy. However, in recent years increased emphasis has been given to the economic value of water.

The Economics of Water

The economics of water is one of the most important aspects of water resource management that needs to be balanced with cultural and social concerns. The concept of treating water as an economic good is valid but the practice of doing so can be challenging.

The use of water for industry and energy are of great importance in terms of the amounts of water used, the cost of investments to provide the water and the economic significance of the resultant production. Every water policy must address the underlying economic issues.

The aim of treating water as an economic good should be to accord water its proper economic value and enable the water economy of the country to be integrated with the broader national economy. Policies relating to the economics of water should ensure optimum efficiency and the most beneficial use while meeting the required objects of social development and environmental sustainability. There are increasing instances, however, of the commercialisation of water and water services.

The most delicate and sensitive point in the consideration of water as an economic good is to ensure that a balance is maintained between ensuring that water for basic human needs is available to the poor and that, where it is used for production or other beneficial use, it is properly and appropriately valued.

Water and Energy

Hydroelectric power is an important source of clean energy. It provides approximately twenty percent of total electricity production worldwide and brings notable economic and environmental benefits. For poor mountainous regions it offers one of the few avenues for economic growth via electricity exports. However, too often in the past such projects have been accompanied by devastating environmental costs.

Policy discussion in this area has been dominated by big dams to the neglect of issues such as small-scale hydropower and water use for cooling in thermal power plants. While most of this water re-enters the water system, the significant change in

temperature and in some cases quality, has serious environmental and resource implications. Dams still remain today one of the most contentious development issues for the water sector.

Private Sector Engagement and Privatisation

Water by its very nature cannot be treated as a mere commodity among other commodities. Catholic social thought has always stressed that the defence and preservation of certain common goods, such as the natural and human environments, cannot be safeguarded simply by market forces, since they touch on fundamental human needs which escape market logic (cf. *Centesimus Annus*, 40).

Water has traditionally been a State responsibility in most countries and viewed as a public good. Governments worldwide, for diverse political and social considerations, may indeed often provide large subsidies to insulate water users from the true cost of water provision. Being at the service of its citizens, the State is the steward of the people's resources which it must administer with a view to the common good.

At the same time, in the interest of achieving more efficient sustainable water services, private sector involvement in water management is growing. It has however proved to be extremely difficult to establish the right balance of public-private partnerships and serious errors have been committed. At times individual enterprises attained almost monopoly powers over public goods. A prerequisite for effective privatisation is that it be set within a clear legislative framework which allows government to ensure that private interventions do in actual fact protect the public interest.

The debate today is not whether the private sector will be involved but how and to what extent it will be present as the actual provider of water services. In any formation of private sector involvement with the state, there must exist a general parity among the parties allowing for informed decisions and sound agreements. A core concern in private sector involvement in the water sector is to ensure that efforts to achieve a water service that is efficient and reliable do not cause undue negative effects for the poor and low-income families.

V. WATER: AN ENVIRONMENTAL GOOD

The debate surrounding water has historically been largely confined to socio-economic issues. Today, in the context of sustainable management of water

resources, the environmental aspect is coming to the forefront along with water's role in supporting ecosystem functioning and species.

This approach to water resources has focussed on sustainable use and on ensuring water utilization that is environmentally sound. A specific proposal to protect aquatic ecosystems and fresh water living resources has been put forward over the years reflecting the extreme threats that exist for many wetlands, rivers and lake ecosystems, deltas and other areas.

Systematic changes to policy approaches are now needed, moving away from a traditional supply-side technical focus to one in which environmental issues are seen as integral to water policies and practices. Policy goals and priorities have in some cases to be re-ordered with frequent use of Environmental Impact Assessments as determinants of decisions on water investments. There is, however, a lack of adequate human resources in this sector. This calls for planning and investments in human resource development.

Environmentally Sound Sanitation

Conventional forms of centralised sanitation are coming under increasing criticism due to huge operating and maintenance costs but more importantly their high water consumption and the groundwater pollution that can result. Further these types of wastewater and sewage disposal systems usually deprive agriculture, and consequently food production, of valuable nutrients.

An alternative approach towards ecologically and environmentally sound sanitation is offered by a concept referred to as "ecological sanitation". This takes the principle of environmental sanitation further in that their focus is keeping the environment clean and safe and preventing pollution. It includes wastewater treatment and disposal and disease prevention activities. It is an approach premised on recycling principles with a key objective of promoting a new philosophy of dealing with what has been regarded as waste.

Disaster Mitigation and Risk Management

A people centred pro-poor policy on water management must address the question of water related hazards such as floods, droughts, desertification, tropical storms, erosion and various kinds of pollution. Many so called natural disasters are in fact man made in their roots, due to inadequate attention to the environment and the consequences of human actions or indeed inaction. Once again, it is the poor

who suffer most when they are exposed to such dangers. But everyone's security is at risk.

More can be done in the areas of monitoring and forecasting of extreme events especially through more efficient early warning system and technical cooperation between poor and more developed countries in devising planning strategies and setting up appropriate infrastructures. Climate variability and change are now recognized as being an essential dimension of such evaluation.

Efforts of humanitarian assistance in response to disasters relating to water must identify the faults which gave rise to such occurrences and ensure that they do not recur. Post disaster reconstruction is not a question of reconstructing the past, but of building for a safer and more ecologically sustainable future.

VI. OTHER ISSUES IMPACTING WATER SUPPLY

The water that exists today would be enough to meet human needs if it were equitably distributed throughout the world. Since it is not, there arise situations of scarcity; some due to natural causes and others due to a range of human activities.

Population

World population has continued to grow throughout history. While the human demand for fresh water has risen steadily, since 1940 the global water withdrawals have risen even faster than the rate of population growth. It is correct to deduce that more people need more water. However, to attribute to population growth a disproportional role misrepresents the true picture. The principal cause in increased demand is not in itself the mere growth of population but the disproportionate and unsustainable use of water for production and consumption by populations in developed countries.

The ever growing concentration of a very high percentage of the world's population in large urban areas, especially in mega-cities, is going to propose new challenges for water and sanitation management, which will seriously impact the short-term and long-term local demand for water.

Politics

Water is a political issue. There is little today that cannot be achieved technically. What is needed is political effectiveness, political will and effective governance.

The political arena is where decisions of water utilisation will take place. The solution to water problems requires the interaction of many spheres and sectors. This interaction must take account of the objectives of safe drinking water, sanitation and food security for all. Politics must ensure proper interaction, through setting correct priorities and the equitable allocation of resources, as well as through fostering interaction between institutions and the engagement and support of local communities, who are the most directly affected. Political will and effective follow through is required for successful action in the water sector. The long-term viability of a country's water supply infrastructure depends on leadership and vision of political leaders, at national and local levels and their capacity to get things done.

New legislation and institutional changes will be needed in many countries to form the framework within which the politics of water supply can be realised. A larger portion of the national budget may need to be directed to the water sector. Political leaders are crucial in generating genuine political support and vision in order to provide the motivation for such changes.

Often the institutional structure of the water sector at government level and the water portfolio is moved about between different ministries and many times is the result of political uncertainty and a lack of political responsibility.

The international political arena must be given its proper role in seeking and formulating global strategies to address water issues. The issue of water cuts across so many areas relating to sustainable development and poses considerable challenges to politics at the international level. Action-orientated responses to the challenges is what the people of the world await.

A Right to Water

A major achievement of recent history has been the ability to elaborate, within the framework of the United Nations, a network of international instruments formally identifying and proclaiming a broad spectrum of universally recognized human rights. Although access to water is a precondition to many of these rights, "clean drinking water" is explicitly mentioned only in the Convention on the Rights of the Child.¹¹ It is however to be found in some regional human rights documents and national Constitutions.

Sufficient and safe drinking water is a precondition for the realization of other human rights. It is argued that water was so fundamental a resource that, just as a right to air was not identified, water was not explicitly mentioned at the time the

fundamental human rights documents were drawn up but was understood as a given which the drafters implicitly included. Furthermore, several of the explicit rights protected by conventions and agreements, such as rights to food, clothing, housing and medical care and necessary social services, cannot be attained or guaranteed without also guaranteeing access to clean water.

There is a growing movement to formally adopt a human right to water. The dignity of the human person mandates its acknowledgement, along with the sound and logical argumentation found in the concept of implicit inclusion. Water is an essential commodity for life. Without water life is threatened, with the result being death. The right to water is thus an inalienable right.

The challenge remains as to how such a right to water would be realized and enforced at the local, national and international levels. Just as, for example, the acknowledgement of the right to food has not eliminated hunger, the promotion of the right to water is a first step and needs careful implementation thought to arrive to the desired goal of access to safe drinking water for all. A right to adequate and safe drinking water should be interpreted in a manner fully consistent with human dignity and not in a narrow way, by mere reference to volumetric quantities and technologies or by viewing water primarily as an economic good.

Poverty

Poverty is the most important factor related to the sustainable provision of basic water and sanitation services. The unavailability of basic services is a primary measure of poverty and poverty is the primary obstacle in the effective provision of basic services. Water scarcity has more dramatic effects for the poor than for the wealthy. The cost of even minimal basic water services is so high that the poor may never be able to afford them.

Sustainable water policies will not be attained in areas which are impoverished in many other aspects. Poor services are a symptom of something fundamental. Authorities are unable to provide the institutional framework and the infrastructures to regulate the sector. Development at the institutional level is needed whereby the priority of water is clearly identified. The authority and responsibility to enable services to operate efficiently must be provided. This will require structures for environmental and economic regulation.

The water services in many developing countries are however still plainly inadequate in providing safe water supplies. This situation is so dramatic that it will

not be overcome without increased development assistance and focused private investment from abroad. Funds released through debt relief could well be utilized in improving water services. Country partnerships can provide a method of institutional building and reform whereby a long-term link can be formed between the water sector of a developed country and that of a developing country. International poverty reduction strategies should focus explicitly on the water needs of the poorest populations.

National and local financial support for the water sector must also increase. Where subsidies are necessary, and they will be necessary, they should carefully target poor and families living in poverty rather than being applied generally. Following consultation at the community level, policies on water and related public health and environmental sectors need to be revised and where lacking established. After such policy change there is need to create or revise the body of laws impacting water that will effectively obtain and allocate the necessary supply of it.

Poverty is about people and their ability to realize their God-given potential. The poor show extraordinary creativity in seeking means of survival in the absence of adequate services. This creativity is a resource which should not be overlooked in working together to build up sustainable communities and avoid the creation of dependence.

Conclusion

Water is an essential element for life. Right throughout human history water has been looked on as something intertwined with humankind. Human beings live alongside water and are nourished by water. It is a source of beauty, wonder and relaxation and refreshment. Our very contact with nature has a deep restorative power. It is no accident that people chose places associated with water for the holidays, in order to renew and regenerate themselves. Water has an aesthetic value.

In the Judeo-Christian Holy Book, God is presented as the source of living water beside which the just man can find life. Because the Bible was written in a part of the world where water is scarce, it is not surprising that water features significantly in the lives of the people. Due to the scarceness of water in the lands of the Scripture, rainfall and an abundance of water was seen as a sign of God's favour and goodness.

Water is a primary building block of life. Without water there is no life, yet water, despite its creative role, can destroy. The Bible opens precisely with the image of the divine spirit hovering over the water at the creation of the universe. In the accounts of creation contained in the first two chapters of the Bible, it is from the midst of the waters that dry land is made to appear, while living reptiles and rich life forms are made to swarm the waters. It is also water that moistens the earth for other forms of life to appear.

The separation of the elements permits them to interact in a positive sense, recognizing the intrinsic value of each. Disorder and confusion among the elements provokes a return to the primeval chaos. Humankind is thus called to live in harmony with creation and to respect its integrity.

Conservation of water is good because it provides for future generations that fundamental good which nourishes and allows us to protect such a source of power beauty and many other nice things.

None of the issues presented here is done in isolation. Only in a true holistic approach can the human being confront the challenges set forward in addressing the issue of water. The Holy See's contribution is presented with the conviction of the central role of the human being in caring for the environment and its constitutive elements. Only when humankind respects the integrity of creation, in conformity to God's providential plan, will we reach a true appreciation of the significance of water in creation and for humankind.

Vatican City, 14 March 2003

- ¹ Selborne, Lord, *The Ethics of Freshwater Use: A Survey*, COMSET Sub-Commission on the Ethics of Fresh Water, p. 5.
- ² Cf. Pope John Paul II, Message for the Celebration of World Day of Peace *Peace with God the Creator, Peace with all Creation*, 1 January 1990, §7.
- ³ Cf. Second Vatican Ecumenical Council, Pastoral Constitution on the Church in the Modern World, *Gaudium et spes*, § 69.
- ⁴ Cf. Pope John Paul II, Encyclical Letter *Sollicitudo rei socialis*, §45.
- ⁵ Pope John Paul II, Encyclical Letter *Centesimus Annus*, §32.
- ⁶ Cf. Pope John Paul II, Encyclical Letter *Sollicitudo rei socialis*, §38-40 and Second Vatican Ecumenical Council *Gaudium et spes*, §100.
- ⁷ Second Vatican Ecumenical Council, *Gaudium et spes*, §86.
- ⁸ Cf. Pope John Paul II, Message for the World Day of Peace 1999 *Respect for Human Rights the Secret of true Peace*, §10.
- ⁹ PriceWaterHouse Coopers, *Water: A World Financial Issue*, March, 2001, p. 10.
- ¹⁰ United Nations, Department for Policy Coordination and Sustainable Development, *Critical Trends: Global Change and Sustainable Development*, 1997, p. 45.
- ¹¹ In Article 24 of the Convention on the Rights of the Child, it is explicitly mentioned that States Parties have the obligation to provide "clean drinking water" to implement the Right of the Child "to the enjoyment of the highest attainable standard of health".
- ¹² cf. Universal Declaration of Human Rights, art.25.

Annex 2: Declaration on Principles for Cooperation on Water-Related Matters and New and Additional Water Resources (February 13, 1996) Multilateral Peace Process in the Middle East, Multilateral Working Group on Water Resources, Oslo, February 13, 1996

<http://www.mfa.gov.il/MFA/Peace%20Process/Guide%20to%20the%20Peace%20Process/Declaration%20on%20Principles%20for%20Cooperation%20on%20Water>

As part of the Program adopted by the *Multilateral Working Group on Water Resources* (MWGWR) of the *Middle East Peace Process*, the Government of Norway has sponsored certain activities of the agenda. Within this context comparative studies on *Water Legislation, Institution, Institutions and Pricing of the Core Parties* were commissioned and executed.

As an outcome of these studies the Parties, facilitated by the Government of Norway and the *Office of Gavelholder*, have identified common denominators in their water resources management systems and proclaimed this Declaration on Principles for Cooperation among the Core Parties on Water-related Matters and New and Additional Water Resources. Although the Core Parties in the Middle East Peace Process are considered to be Jordan, Syria, Israel, Lebanon and the PLO for the benefit of the Palestinian Authority, for the purposes of this Declaration, the term the *Core Parties* are those who are signatories to this Declaration. The Core Parties agree that this Declaration and the cooperation there under will not affect or alter in any form or manner any of the bilateral or other agreements or undertakings among them, nor does it prohibit or constrain any bilateral arrangements, understandings or agreements aimed at enhancing cooperation in water-related matters. The Core Parties view this Declaration as an expression of:

- The role of the multilateral talks in promoting cooperation and confidence-building in the field of water resources and in the importance of cooperation for the promotion of matters of mutual interest.
- A joint resolve to cooperate among them in the development of New and Additional Water Resources.
- The importance of water resources management on the basis of locally compatible legal, economic and institutional frameworks and principles.
- The recognition that cooperative efforts among them will facilitate the development of New and Additional Water Resources for their joint benefit.

- The ability to cooperate on the basis of the common denominators identified within their respective water management systems.

The Core Parties proclaim as objectives of their cooperation:

- Identifying the needs for New and Additional Water Resources;
- Identifying potential New and Additional Water Resources and the development thereof;
- Combining their cooperative efforts in the development of New and Additional Water Resources; and
- Enhancing their water supply, and increasing the efficiency of its use.

The Declaration consists of three parts, namely: *Common Denominators*, *Principles of Cooperation on New and Additional Water Resources*, and *Cooperation on Other Water-Related Matters*.

Common Denominators

The Core Parties identified and agreed to the following common denominators in their water legislation as a basis for cooperation among themselves:

1. Water Resources in Legislation

Their respective water legislations apply to all types of water resources including wastewater and desalinated water.

2. Ownership and Administration of Water Resources

All water resources of each party are publicly owned and/or centrally controlled. They are used for the benefit of their respective societies. The Core Parties promote public participation in water resources management. Well drilling, water production and supply are allowed only by permit or license.

A Central Water Authority/ Government Agency exist in each of the Core Parties, and exercises effective control over water resources.

3. Allocation

Domestic uses occupy the first priority in the allocation of water resources.

4. Drought Measures

The Core Parties will take appropriate measures in periods of drought and water scarcity.

5. Water Quality and Protection

Water quality standards for various water uses have been adopted by each of the Core Parties; water preservation is an overriding concern, and enforcement

powers exist in the hands of competent authorities to prevent water pollution, and to mitigate any negative environmental impacts on them at the expense of the polluters.

6. Data and Record Keeping

Obligations exist, pursuant to the legislation of each Core Party, to measure, monitor and keep proper record of all water production, supplies and consumption.

7. Compliance and Enforcement

Proper sanctions against non-compliance are explicit in the respective legislation of each of the Core Parties. Enforcement of the water legislation is the norm.

8. Water Charges

Water is not supplied free of charge in any of the Core Parties. Tariff structures, taking into account different extents of cost recovery, apply to domestic, industrial and agricultural sectors. These tariffs are periodically reviewed and adjusted.

Principles of Cooperation on New and Additional Water Resources

1. Definitions

For the purpose of this Declaration:

- *New and Additional Water Resources* are only those potential water resources which are not Existing Water Resources, and which are not part of new and additional water resources developed pursuant to bilateral agreements.

- *Existing Water Resources* are the individual resources of each of the respective parties' renewable, non-renewable and waste water resources.

- *Cooperating Parties* are those of the Core Parties, signatories to this Declaration, which actively participate in the development of any specific Project relating to new and additional water resources.

- *A New and Additional Water Resources Project*, hereinafter the *Project*, means a project among Cooperating Parties to develop New and Additional Water Resources by specific agreement.

2. General Principles

- The development of New and Additional Water Resources will not adversely affect the development or utilization of Existing Water Resources.

- All arrangements with respect to New and Additional Water Resources will be limited in time and subject to periodic mutual review.

3. Mechanisms of Cooperation

- Cooperation among the Core Parties will be carried out by their respective water institutions through joint bodies on a ministerial and managerial level to be established, as appropriate, for each respective Party.

- Each Project requires the consensus of all the Cooperating Parties for implementation.

4. Ownership and Utilization

- New and Additional Water Resources, developed in joint effort by the Core Parties for the benefit of some or all of them, will be considered as part of their own water resources only to the extent of the share allocated to them.

- Details concerning the utilization and ownership will be the subject of separate agreements for each Project.

- Each Core Party can apply its legislation, within its respective jurisdiction, on the share allocated to it by each Project.

5. Technical, Economic and Financial Issues

- Projects will be technically, economically, and financially sustainable.

- The Cooperating Parties will carry their respective share of the project financing including the costs of operation, maintenance, and amortization of the Project. Due regard will be given to less developed Cooperating Parties and joint efforts will be made to assist in the obtaining of financing on favourable terms, provided that no such efforts affect any of the bilateral donor/recipients arrangements or protocols.

- The Cooperating Parties agree to participate jointly in the raising of the funds needed for the Project implementation, and to secure the funds needed for the operation and maintenance of the new water system.

- The cost to each of the Cooperating Parties of water derived from New and Additional Resources will be based upon the cost of production, operation, maintenance and amortization.

- Water derived from the New and Additional Resources will not be subject to levies on account of conveyance, storage, treatment, or protection in excess of levies which the owner of the project would normally incur.

- Cooperating Parties may, by mutual consent, trade the use of their respective shares of the waters from New and Additional Resources, provided that

such trading does not cause harm to the shares allocated to any other Cooperating Parties.

6. Environmental Management

- All Projects will be based on environmentally sound principles.
- The Cooperating Parties give preference to those Projects which utilize advanced technological water usage methods.
- Each Cooperating Party is responsible for the protection of the Project against environmental pollution originating within its jurisdiction.

7. Water Protection

- Each Cooperating Party is responsible for the prevention of harm to those parts of the Projects under its jurisdiction.
- Such responsibility includes *inter alia* the preservation of water quality and the prevention of unauthorized withdrawals.

8. Operation and Maintenance

The Cooperating Parties will set the standards for the operation and maintenance of the Projects.

9. Areas of Cooperation

It is understood that the following potential areas of cooperation in the development of New and Additional Water Resources for the Cooperating Parties will be further studied in order to determine their feasibility:

- Acquisition and import of water including the possibility of carrying such waters through existing or new supply systems (wheeling);
- Development of desalination plants;
- Rainfall enhancement; and
- Any other relevant area of cooperation.

Cooperation on Other Water-Related Matters

Cooperation on other water-related matters, although originating among the Core Parties, will be open to regional and extra-regional parties of the Multilateral Working Group on Water Resources.

1. Cooperation on Specific Sectors

The Parties express their desire to cooperate among themselves and with other interested Parties on the following *Other Water-related Matters*:

- Weather forecasting, climatology, weather modification, and meteorology;

- Environmental conservation;
- Sustainable water-related natural resources management and desertification control;
- Enhancement of public awareness and participation; and
- Human resources development

2. Proposed Areas of Cooperation

The Core Parties will in due time explore possible cooperation among themselves and with other interested parties in the following areas:

- Collection, filing, processing, transmission and exchange of water data and related information.
- Preparation of plans for flood-protection and utilization; with emphasis on development of *Early Warning Systems*;
- Development of norms, standards and specifications for water devices, equipment and infrastructure;
- Transfer and adoption of advanced technology throughout the chains of water storage, conveyance and application, including automation and controls of water systems; particularly related to reduction of crop water requirements;
- Water-energy interactions, with emphasis on desalinization;
- Establishment of a Regional Centre; and
- Identification of ways to achieve optimal use of water in the agricultural sector.

3. Mechanism of Cooperation

- The Cooperating Parties will decide on the mechanism of their cooperation on other water-related matters set out in this section.
- All decisions with respect to cooperation on Other Water-related Matters will be adopted by consensus.

4. Specific Cooperation

- The Core Parties agree to hold Regional Seminars on various water-related matters;
- The Core Parties agree to publish the results of their cooperation in a Regional Publication.

5. Extended Cooperation

The Cooperating Parties may by consensus agree to include additional water-related matters in their cooperation.

**Annex 3 Paper of Common Understanding Between Hezbollah and the Free
Patriotic Movement. February 6, 2006**

http://www.tayyar.org/tayyar/articles.php?article_id=10411&type=news

1- Dialogue

National dialogue is the only avenue to find solutions to Lebanon's crises on stable and firm bases that are a reflection of a unifying consensual will. The following conditions must be obtained to ensure its success:

- a-** The participation of parties that have a political, popular and national standing with a round table as a venue;
- b-** Transparency, openness, and placing the interests of the nation above any other interest, through the reliance on self-driven will and a free and committed Lebanese decision-making;
- c-** Include all national issues that require general consensus.

2- Consensual Democracy

Consensual democracy remains the fundamental basis for governance in Lebanon because it is the effective embodiment of the spirit of the Constitution and the essence of the pact of shared coexistence. From this standpoint, any approach for dealing with national issues according to a majority-minority formula depends on historic and social conditions for practicing effective democracy in which the citizen becomes a self-standing value.

3- The Electoral Law

The reform of political life in Lebanon requires the adoption of a modern electoral law, where proportional representation may be one of its effective means that guarantees accurate and just popular representation and contributes to the accomplishment of the following objectives:

- a-** Activate and develop the role of political parties in achieving civil society;
- b-** Limit the influence of political money and sectarian fanaticisms;
- c-** Make available equal opportunities for using the various means of the media;
- d-** Ensure the required means to enable the Lebanese expatriates to exercise their voting rights.

We ask the Government and Parliament to commit to the shortest possible deadline to enact the required electoral law.

4- Building the State

Building a modern state that has the trust of its citizens and is able to meet their needs and aspirations, and provide them with the sense of security and safety as to their present and future, requires that the state should be erected on strong and solid foundations that make it impervious to destabilization and periodic crises whenever it is faced by difficult challenges and changing circumstances. This requires the following:

- a-** Adopt the standards of justice, equality, parity, merit and integrity;
- b-** An equitable and impartial judiciary is the essential condition for creating a state of rights, laws and institutions based on:
 - The complete independence of the judiciary and the selection of judges with recognized competence in order to activate the work of all courts;
 - The respect for actions of the constitutional institutions while keeping them away from political polarization, ensure the continuity of their work and prevent their blockage (the Judicial Council and the Constitutional Council). What happened in the Constitutional Council is an example of such blockage, when the legal challenges of parliamentary elections submitted to it have not been acted upon;
- c-** Eradicate corruption from its roots, because temporary and partial solutions are no longer sufficient. They have in fact become an exercise in bluff that the beneficiaries of corruption at all levels carry out to perpetuate their theft of the resources of the state and its citizens. This requires:
 - Activating the institutions and boards of financial and administrative control and inspection, while ensuring their strict separation from the executive power to guarantee that their work is not politicized;
 - Conducting a complete survey of the cases of corruption, in preparation for opening judicial investigations that would lead to the prosecution of those responsible for corruption, and to the return of embezzled public funds;
 - Legislating the required laws that contribute to combating all aspects of corruption and calling upon the Government to sign the United Nations Convention against Corruption;

- Working toward a comprehensive administrative reform that ensures that the right person is assigned to the right position, particularly those whose merit, competence and integrity are recognized. This can be accomplished by empowering the Civil Service Council to assume its full prerogatives;
- Setting deadlines for actions on these issues because the factor of time has become critical. This matter requires fast and judicious solutions which would use the time factor to their advantage instead of the corrupt using it to theirs.

5- The Missing During the War

To turn the page of the past and achieve a comprehensive national reconciliation, all the outstanding files of the war must be closed. The file of the missing in the war requires a stance of responsibility to end this anomalous situation and put the parents' minds at ease. The parents cannot be asked to forgive without respecting their rights to know the fate of their children. This is why we ask all parties involved in the war for their full cooperation to uncover the fate of the missing and the locations of the mass graves.

6- The Lebanese in Israel

Whereas both sides are convinced that the presence of Lebanese citizens in their homeland is better than their presence in enemy territory, a resolution of the question of the Lebanese residing in Israel requires a speedy action to ensure their return to their country while taking into consideration all the political, security and livelihood circumstances surrounding the matter. On this basis, we call upon them to promptly return to their country in the spirit of the call by Sayyed Hassan Nasrallah following the Israeli withdrawal from south Lebanon and the speech delivered by Michel Aoun at the first session of Parliament.

7- The Security Question

First, Political Assassinations:

Any form of political assassination is condemned and rejected because of its violation of basic human rights and of the most important foundations of the existence of Lebanon represented by difference and diversity, and of the essence of democracy and its practice. Therefore, to the extent that we condemn the assassination of Former Prime Minister martyr Rafiq Hariri and all assassinations and

assassination attempts that preceded and followed it, leading to the assassination of MP Gebran Tueni, we emphasize the importance of moving forward with the investigation according to the officially approved mechanisms in order to uncover the truth. This is an issue that cannot be subjected to any compromise because it is a required condition to achieve justice and serve it against the criminals, as well as to bring an end to the cycle of murder and bombings. For this reason, it is an obligation to keep these issues away from any attempts at political exploitation, which would harm their essence, and the essence of justice that must remain above any political conflicts or disagreements.

Second, Security Reforms:

A reform of the Security Services is an inseparable part of the broader reform process of state institutions and their rebuilding on sound and solid bases, Given the dedicate position that the Security Services occupy in protecting and defending a stable security environment in the country against any breaches or threats, the process of building those services must be given special attention. Therefore, the government is urged to assume its full responsibilities as follows:

- a-** Put in place an integrated security plan based on the centralization of security decision and on a clear definition of enemy versus friend, the determination of security threats, including the issue of terrorism as well as the security breaches that must be dealt with;
- b-** Dissociate the Security Services from any political consideration, for their full loyalty should be to the nation;
- c-** Assign the responsibility of the Security Services to personalities with recognized competence and integrity;
- d-** Security measures must not be in conflict with the basic freedoms guaranteed by the Constitution, most of all the freedom of expression and political action, which do not threaten security and public stability;
- e-** Constitute a Parliamentary Intelligence Committee that would oversee the reform and building processes of the Security Services.

8- *Lebanese-Syrian Relations*

The establishment of balanced and sound Lebanese-Syrian relations requires a review of the past experience while drawing the necessary conclusions and lessons in order to avoid the accumulated mistakes, blemishes and breaches.

This is in order to pave the way to build these relations on clear bases on parity and the full and mutual respect for the sovereignty and independence of both states, on the grounds of rejecting the return to any form of foreign tutelage.

Therefore, it is necessary:

- a-** That the Lebanese government take all legal measures and procedures pertaining to the assertion of the Lebanese identity of the Shebaa Farms and present these to the United Nations, now that the Syrian state has declared the Shebaa Farms to be fully Lebanese.
- b-** To demarcate the borders between Lebanon and Syria away from the tensions that could block this operation which both Lebanon and Syria have had a long-standing need to achieve through a mutual agreement;
- c-** To ask the Syrian state to fully cooperate with the Lebanese state to uncover the fate of the Lebanese detainees in Syrian prisons without the provocation, tension, and negativity that would hinder a positive settlement of this file;
- d-** Establish diplomatic relations between the two countries and provide appropriate conditions for them, thus transferring them from a relation between individuals and groups to a relation between institutions in order to secure their permanence and stability.

9- Lebanese-Palestinians Relations

Addressing the Palestinian file requires a comprehensive approach that asserts, on the one hand the respect by the Palestinians of the authority of the Lebanese state and their compliance with its laws, and on the other hand the reaffirmation of solidarity with their cause and the recovery of their rights, in accordance with the following rules:

- a-** The social condition of the Palestinians requires a strong attention to improve their living conditions and secure a decent standard for a dignified human life on the basis of bilateral cooperation and the human rights charter, in addition to facilitating their movement inside and outside Lebanese territory;
- b-** The Right of Return of the Palestinians is a fundamental and permanent right, and the rejection of the settling of Palestinian refugees in Lebanon is an issue that has the consensus of the Lebanese people and cannot be concerned under any circumstances;

- c-** Define the relationship between the Lebanese state and the Palestinians in a single institutional Palestinian framework that would be a legitimate representative of the Palestinian people in Lebanon in a manner conducive to proper coordination and cooperation;
- d-** The issue of putting an end to Palestinian weapons outside the camps and controlling the security situation inside them should be dealt with as part of a serious, responsible and close dialogue between the Lebanese government and the Palestinians, leading to the exercise of the state's authority and laws over the entire Lebanese territory.

10-The Protection of Lebanon and the Preservation of its Independence and Sovereignty

Protecting Lebanon and preserving its independence and sovereignty is a national public responsibility and duty, guaranteed by international treaties and the Human Rights Charter, particularly in confronting any threats or dangers from any source. Therefore, carrying arms is not an objective in itself. Rather, it is an honourable and sacred means exercised by any group whose land is occupied, similar in this way to the methods of political resistance.

In this context, Hezbollah's weapons should be addressed as part of a comprehensive approach that falls within two bounds:

- The first bound is the reliance on justifications which meet national consensus, and which would constitute a source of strength for Lebanon and the Lebanese people for keeping the weapons;
- And the other bound is the definition of objective conditions that would lead to a cessation of the reasons and justifications for keeping those weapons.

And since Israel occupies the Shebaa Farms, imprisons Lebanese resistance members and threatens Lebanon, the Lebanese people should assume their responsibilities and share the burden of protecting Lebanon, safeguarding its existence and security, and protecting its independence and sovereignty by:

- a-** Liberating the Shebaa Farms from Israeli occupation;
- b-** Liberating the Lebanese prisoners from Israeli prisons;
- c-** Protecting Lebanon from Israeli threats through a national dialogue leading to

The formulation of a national defence strategy over which the Lebanese agree to and subscribe to by assuming its burdens and benefiting from its outcomes.